American
Foundryman
The Foundryman's Own Magazine
FEBRUARY
1952

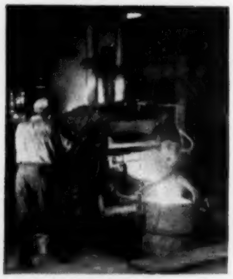
"'Specials' are routine... with our *Lectromelt* furnace"

"'Special' irons for 'special' castings are actually routine production in our factory," says one gray iron foundry plant engineer. His chief metallurgist adds, "The electric furnace process is the only way to produce irons that will meet the tensile strength and machinability requirements that our customers need in special castings."

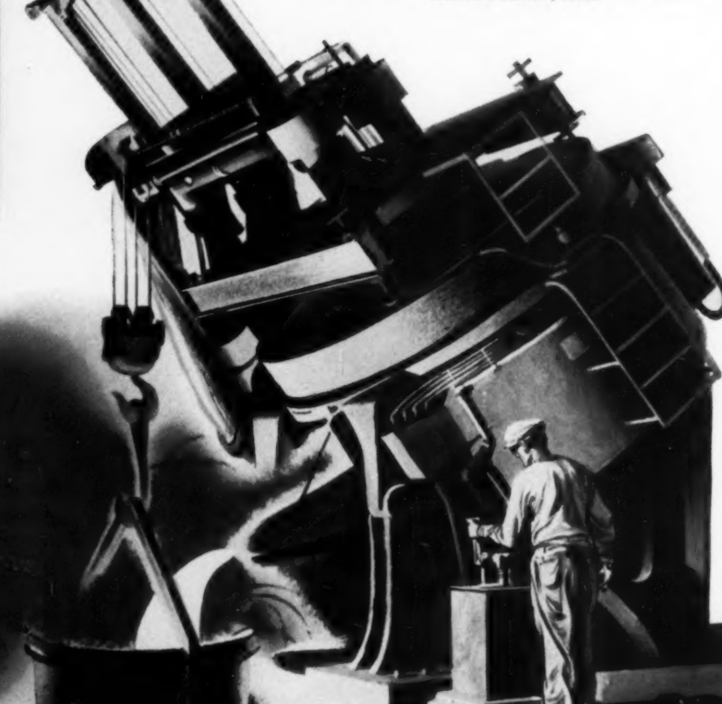
The furnace he mentioned, of course, was a Lectromelt*—and the results he mentioned are typical of the precise control that Lectromelt furnaces make possible, whether you're working with irons, semi-steels or alloy steels. Precise control at costs often comparable to cupola melting—and with unmatched flexibility.

Labor-saving, top-charging Lectromelt Furnaces make possible such precise control at low cost, whether you're melting or smelting, refining or reducing. Our engineers will gladly discuss means of cutting costs for these operations, without cutting quality. Write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pa.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd. Toronto 2...ENGLAND: Birlec, Ltd., Birmingham...AUSTRALIA: Birlec, Ltd. Sydney...FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bresseux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.



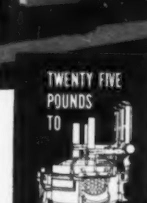
Pouring a "special" that's really routine; duplexing in this Lectromelt Furnace gives castings specified wear-, heat- and pressure-resistance.



*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



TOMORROW'S CORE BLOWER . . . TODAY!

Federal presents the
NEW FULL-AUTOMATIC "SAN-BLO"

The NEW FOR '52 "SAN-BLO" — the fastest, most efficient core blower! Time consuming, manual operations are performed by electric controls, described below. Complete operation of blowing cycle is reduced to simply pressing one starting button—the controls do the rest. The amazing new controls are *plus* features, in addition to SAN-BLO's motor-driven plows and aerating air circuit. These exclusive design features made possible for the first time the successful blowing of *any* core sand that could be hand-rammed, and blowing *any* size core up to 40 lbs. without changing sand magazine.

BLOWS 10 LB. CORES IN 2½ SECONDS—40 LB. CORES IN 5 SECONDS

In only 2½ seconds from the time the starting button is pressed, a uniform, accurate 10 lb. core is ready to be taken from the machine. In only 5 seconds, a 40 lb. core. The ultimate in fast production of high quality cores made from any core sand mixture.

AUTOMATIC, ELECTRICALLY-TIMED FILLING OF SAND MAGAZINE

The large sand magazine does not require refilling after each blow. An electric counter controls automatic refilling. At intervals, depending on size of core being blown, magazine automatically swings back under hopper, fills and returns to blowing position. Motor-driven agitator in sand hopper provides immediate filling of sand magazine, and operates only when magazine is in filling position.

AUTOMATIC, ELECTRICALLY-CONTROLLED BLOWING CYCLE

An electric timer, graduated in seconds, provides correct timing of the blowing cycle. Size of core and type of sand being blown govern setting of timer. Fixing the time of the blowing cycle assures a steady production of uniform cores.

MECHANICAL MOVEMENT OF SAND IN SAND MAGAZINE

Motor-driven plows, which operate only during blowing cycle, revolve in lower part of sand magazine, move sand mechanically to blow hole and keep an even distribution of sand over entire blow plate. No "piping" or "bridging" in sand magazine at any time. An "aerating" air circuit feeds air, under full pressure, through a fine mesh screen which forms the lower inner wall of the sand magazine. By aerating the sand and moving it mechanically, SAN-BLO can blow *all* types of core sand and blow them to uniform hardness.

AUTOMATIC DRAWING OF CORE FROM COPE OF CORE BOX

An air-oil controlled clamping table, with 6" stroke, provides vertical clamping of core box. By fastening the cope half of core box to blow plate and blowing into a drier, core can be drawn from the cope. By setting up a conveyor system at rear of machine, cores on driers can be ejected as empty driers are inserted in blowing position from the front.

- **Quick Job Changes**
  One adjustment wheel quickly raises or lowers sand magazine to accommodate core box. Sand magazine is standard — is never changed.
- **Wide Range of Core Boxes**
  The SAN-BLO will blow all cores from the smallest to those weighing 40 lbs. each—and blow them all from its one standard sand magazine.
- **80% Sand Delivery**
  The SAN-BLO blows 40 to 42 lbs. of its 50 lb. magazine load because sand is moved mechanically to the blow hole. No "piping" or "bridging".
- **Automatic Safety Features**
  Air pressure is cut off automatically while sand magazine is being refilled. Blowing cycle cannot start unless the core box is in blowing position.

Write for new Bulletin CB-3

FEDERAL

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THE FEDERAL FOUNDRY SUPPLY COMPANY

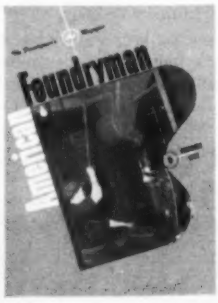
4600 EAST 71st STREET • CLEVELAND 5, OHIO

VOLUME XXI, NUMBER 2

American Foundryman

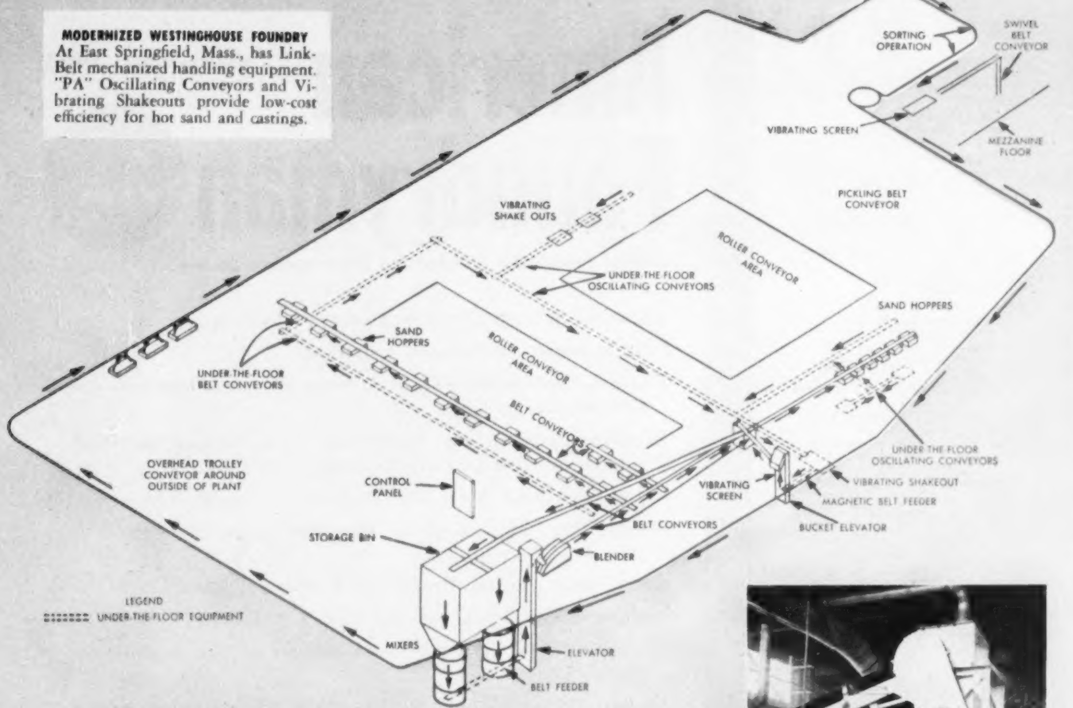
February, 1952

Official publication of American Foundrymen's Society



Overhead source of sand for two molders is an important part of small, effective mechanization program completed at Arrow Pattern & Foundry Co., Chicago, recently. Entire unit, described in Modern Foundry Methods on page 57, enabled molders to raise production without increased effort by 30 per cent within a week.

Published monthly by the American Foundrymen's Society, Inc., 616 S. Michigan Ave., Chicago 5. Subscription price in the U. S., Canada and Mexico, $3.00 per year; elsewhere, $6.00. Single copies, 50. Entered as second class matter July 22, 1938, under Act of March 3, 1879, at the Post Office, Chicago, Illinois. CENTRAL REPRESENTATIVE—R. E. Cleary, Commercial & Savings Bank Bldg., Berea, Ohio. MIDWESTERN—H. Thorpe Covington Co., 677 N. Michigan Ave., Chicago, Ill. EASTERN REPRESENTATIVE—Robert B. Weston, Gedney House, 65 Old Mamaroneck Rd., White Plains, N. Y. Telephone: 6-9558.



MODERNIZED WESTINGHOUSE FOUNDRY
At East Springfield, Mass., has Link-Belt mechanized handling equipment. "PA" Oscillating Conveyors and Vibrating Shakeouts provide low-cost efficiency for hot sand and castings.

Boosts melt 67%
cuts manual lifting 80%

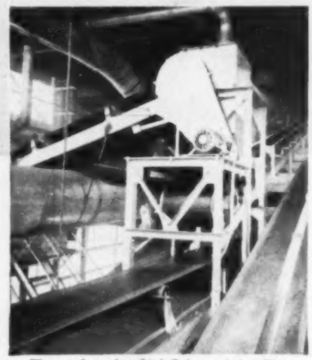
LINK-BELT mechanized sand and castings handling equipment pays double dividend in moderaized Westinghouse foundry

Greater capacity in the same building . . . at lower cost. Improved working conditions and less labor turnover. Better control of casting quality. Westinghouse Electric Corp. achieved all these recently when they modernized their East Springfield (Mass.) foundry.

And, like so many other foundries, they came to Link-Belt for the latest in mechanized sand and casting handling equipment. Link-Belt engineering experience and superior equipment has paid off for Westinghouse from the first day on.

They now melt 100,000 lbs. of gray iron in one shift, compared to the former 60,000 lbs. Working conditions are so improved they can attract the right kind of labor. Manual lifting has been reduced from 1470 to 294 tons per day . . . and air is completely changed eight times an hour.

You, too, can keep step with the quickening tempo of today's production by calling in Link-Belt to help plan your foundry mechanization. Our specialists will work hand-in-hand with your consultants.


Three of twelve Link-Belt sand handling Belt Conveyors providing smooth-rolling high capacity in modularized Westinghouse foundry.

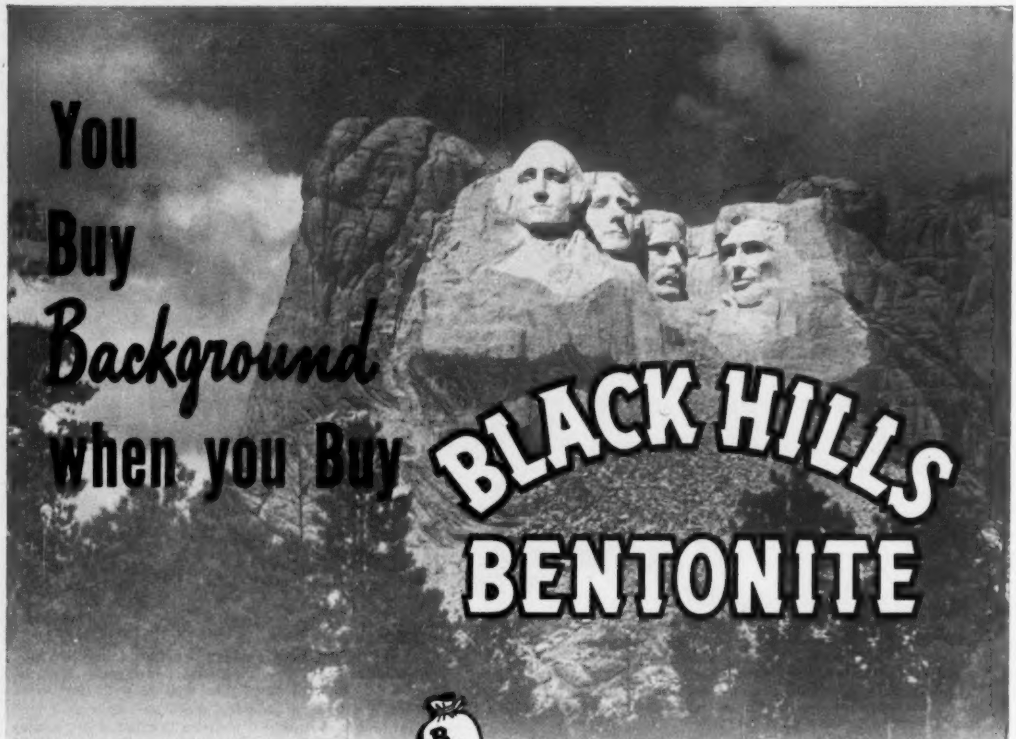

Outside building, 600 ft. L-B Overhead Trolley Conveyor, cools and moves castings to sorting, keeps heat out of foundry.

MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

LINK-BELT

...VEYORS and PREPARATION MACHINERY

... COMPANY: Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.



Black Hills Bentonite surpasses all other bond clays in resilience. It excels all other clays in dry strength. Combining high hot strength and high permeability, it surpasses all other clays in this two-fold respect. But—

Instead of enlarging upon the value of these virtues, suppose we emphasize the experience behind every bag of Black Hills Bentonite. *We recommend it to you only if it fits your job best.* This we can do disinterestedly, because we make and market a complete line of bonding clays and do not need to force the same product into every situation. You may rely 100% on the counsel our research and service departments offer you.

Yes, sir, when you buy Black Hills Bentonite, you buy background worth much to you. Yet Black Hills costs not a cent more!

REFRACTORIES, TOO!

For patching cupolas enduringly and at a great saving, investigate Cupoline, a remarkable refractory, and Bondactor, as remarkable a machine for applying Cupoline. You can't top this combination.

EASTERN CLAY PRODUCTS
DEPARTMENT
International Minerals & Chemical Corporation
JACKSON, OHIO

ECP

BONDING CLAYS and EXCEPTIONAL FOUNDRY SERVICE

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DIXIE BOND • BLACK HILLS BENTONITE
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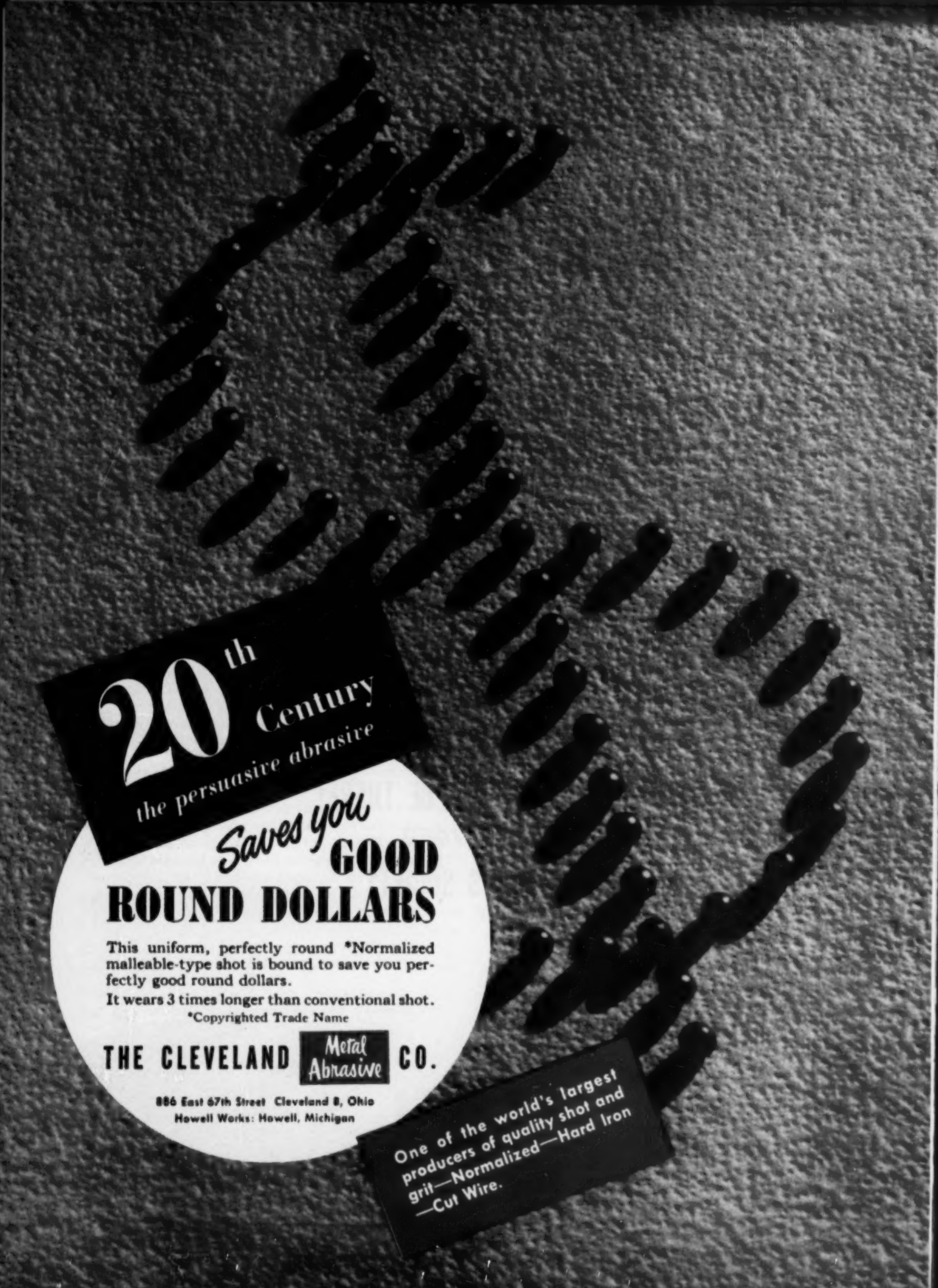
BALANCED REVIVO

BONDACTOR EQUIPMENT • CUPOLINE REFRACTORY • DURA PRODUCTS


20th Century
the persuasive abrasive
Saves you GOOD ROUND DOLLARS
This uniform, perfectly round *Normalized malleable-type shot is bound to save you perfectly good round dollars.
It wears 3 times longer than conventional shot.
*Copyrighted Trade Name
THE CLEVELAND Metal Abrasive CO.
886 East 67th Street Cleveland 8, Ohio
Howell Works: Howell, Michigan
One of the world's largest producers of quality shot and grit—Normalized—Hard Iron —Cut Wire.

The Fast Way is the Cheapest Way to Make Cores

YOU PAY NO PREMIUM for speed. In fact, you get bonuses all the way. First, you cut handling time. Here's how: In conventional core making practice, cores are placed on a collecting rack; they are then removed and placed in an oven. The hot, smoking cores are removed by asbestos gloved workers and placed on a cooling rack. From there they go to storage.

Using a *Foundromatic* dryer — core makers simply place the green cores on the moving belt of the dryer. In a few minutes they come out — cool enough to handle with bare hands and ready to use . . . a big saving in handling and baking time!

Next, you cut up to 60% fuel cost. All the heat goes into the core — none into the room. Warmup time is short and this new *Foundromatic* dryer can be turned off when it's not being used.

In addition, core quality is improved. Over-baking of cores is impossible . . . burning of fins or thin sections is ended.

Cores that will pass through an aperture 36 inches wide and 13 inches high can be dried in the *Foundromatic* sand core dryer. For details, call your nearby Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS A-C

THE CORE BOX
Questions and Answers About Dielectric Sand Core Drying

1. Do I need an electronic engineer to help me with the *Foundromatic* dryer?

No. Once equipment is installed and operating, any personnel can be quickly trained to follow simple operating instructions.

2. How long will tubes last?

Tubes have an estimated life of 5000 hrs.

3. How much maintenance is there?

Very little. Periodic replacement of tubes; oiling of rollers, and conveyor and blower motors.

4. Why is oven separate from heater?

To eliminate possibility of evaporated moisture being deposited on heater parts causing arcing, and to simplify installation and maintenance.

5. Can capacity be increased by adding another heater?

Yes. Simply add heater with minor oven changes.

6. How does the core dry?

By passing high frequency currents through the moist sand the molecules are set in motion and the resultant friction generates sufficient heat to drive off the moisture from the center to the outside.

7. What about collapsibility?

Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

8. Can core wash be eliminated?

In many cases, yes. The resin forms an atmosphere conducive to smooth castings.

9. Does the *Foundromatic* core dryer use power when empty?

No. Industrial heaters inherently deliver no power unless material is between the electrodes.

10. Why are rubber or fabric belts used?

Arcing is reduced, cores are given a smoother ride, and the low loss material requires no heat.

ALLIS-CHALMERS
MILWAUKEE 1, WIS.
Send me new 8 page Bulletin 15B7306B.

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Title

Company

City State

A-3559

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How to Control Composition of Cast Iron With Silicon and Manganese Briquets

Control of the composition of cupola-melted cast iron becomes a simple matter through the use of alloy briquets.

These briquets make the old practice of blending two or three pig irons of high and low silicon and manganese contents, to produce a desired composition, both unnecessary and undesirable. A single grade of pig iron can be stocked, and any desired composition in the product can be obtained, simply and economically, by the addition of silicon and manganese briquets.

Function of Silicon in Iron

In cast iron, silicon acts as a deoxidizer and graphitizer. It promotes the formation of flake graphite and softens the iron.

When either the carbon or silicon content of an iron is too low for the section thickness involved, the result will be the formation of chilled spots (iron carbide) at corners and in other rapidly cooled locations. This has an adverse effect on the machinability of the iron and the life of the tools used to machine it. On the other hand, excessively high carbon or silicon content in heavier sections results in open-grained iron that is both soft and weak.

How Silicon Aids Carbon Control

A rather definite relationship exists between the silicon level in a pig iron and its carbon content, as shown in Figure 1.

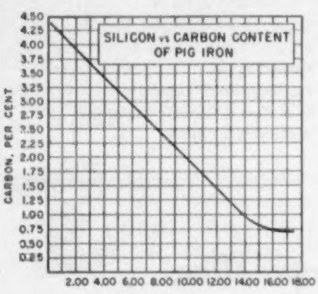


Fig. 1—Relation of silicon and carbon content in pig iron. Notice that the carbon level gradually decreases as the silicon is increased.

As indicated in Figure 1, an increase in the silicon content of a pig iron has a decided effect in lowering its carbon content. When producing soft iron, where it is desirable to hold the carbon on the high side, pig iron running in the range of 2.0 per cent silicon is desirable in the cupola charge, rather than the higher silicon grades of pig sometimes used in these irons. The additional silicon needed to meet the desired chemical analysis can be easily and economically added to the charge in the form of silicon briquets. This provides an economical and flexible system of chemical control.

Function of Manganese in Iron

Manganese acts as a scavenger to deoxidize iron. As an alloying element, it imparts density and high strength. It combines with sulphur to form manganese sulphide, which does not have the harmful characteristics of the iron-sulphide inclusions that form when manganese is not present. A manganese-sulphur ratio of 6:1 is suggested.

Briquets Give High Alloy Recovery

Silicon and manganese briquets are manufactured by ELECTROMET in the sizes shown in Table I. These "EM" briquets are all made with a binder that prevents oxidation until the alloy unites with the iron in the melting zone of the cupola. Thus, the recovery of alloy is high—usually over 90 per cent for silicon and about 85 per cent for manganese.

Booklet Available

Further information is given in our booklet, "Briquetted Alloys For The Iron Foundry Industry." This booklet contains information about "EM" briquets of silicon, silicomanganese, ferromanganese, and chromium. To obtain a copy, free of charge, write or phone our nearest office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Table I. "EM" Briquetted Alloys for Cupola Additions

Type of Briquet	*Gross Weight*	*Alloy Content*
"EM" Silicon Briquets (two sizes) Round	5 lb.	2 lb. Silicon
	2½ lb.	1 lb. Silicon
"EM" Silicomanganese Briquets Square	3½ lb.	½ lb. Silicon 2 lb. Manganese
"EM" Ferromanganese Briquets Oblong	3 lb.	2 lb. Manganese

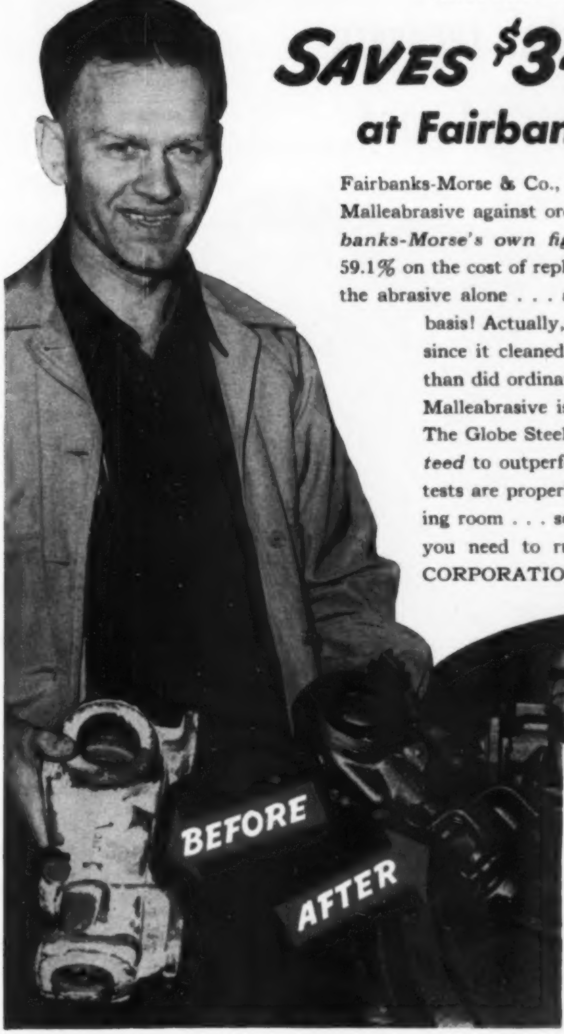
Table II. Typical Briquet Mixture for Soft Gray Iron

Base Charge			*Alloys in Charge Material*			
			Silicon		*Manganese*	
Per Cent	*Lb.*	*Material Charged*	*Per Cent*	*Lb.*	*Per Cent*	*Lb.*
40.0	400	Pig Iron	2.25	9.00	0.75	3.00
40.0	400	Return Scrap	2.50	10.00	0.65	2.60
20.0	200	Purchased Scrap	2.28	4.56	0.55	1.10
100.0%	1,000 lb.	Total Base Charge		23.56		6.70
Briquets Required		4 Small Silicon Briquets		4.00		—
		½ Silicomanganese Briquet		0.25		1.00
		Total Alloys Charged		27.81 lb. Si or 2.78% Si		7.70 lb Mn or 0.77% Mn
		Melting Recovery Factor		x .90		x .85
		Final Analysis of Iron		2.50% Si		0.65% Mn

MALLEABRASIVE®*

(SHOT AND GRIT)

SAVES $3450.00 A YEAR at Fairbanks-Morse & Co.



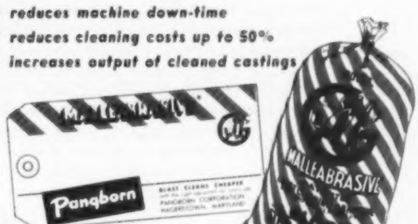
Fairbanks-Morse & Co., Freeport, Ill., took us up on our offer to test Malleabrasive against ordinary grit in their own shop. Here are *Fairbanks-Morse's own figures:* During the test, Malleabrasive saved 59.1% on the cost of replacement parts . . . saved 14.6% on the cost of the abrasive alone . . . adding up to a total of $3454.40 on a year's basis! Actually, Malleabrasive's advantages are even greater, since it cleaned an average of 10.8% more tonnage per hour than did ordinary grit!

Malleabrasive is the *original* long-life abrasive pioneered by The Globe Steel Abrasive Co., Mansfield, Ohio. It is *guaranteed* to outperform ordinary shot and grit when comparative tests are properly run. Test Malleabrasive in your own cleaning room . . . send for your free kit, containing all the forms you need to run this impartial test. Write: PANGBORN CORPORATION, 1300 Pangborn Blvd., Hagerstown, Md.

Here's why Malleabrasive saves you money:

MALLEABRASIVE

- *is designed for modern cleaning equipment*
- *wears out fewer machine parts*
- *lasts 2 to 4 times longer*
- *reduces machine down-time*
- *reduces cleaning costs up to 50%*
- *increases output of cleaned castings*



Packed in orange striped 100 pound bags with this tag

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

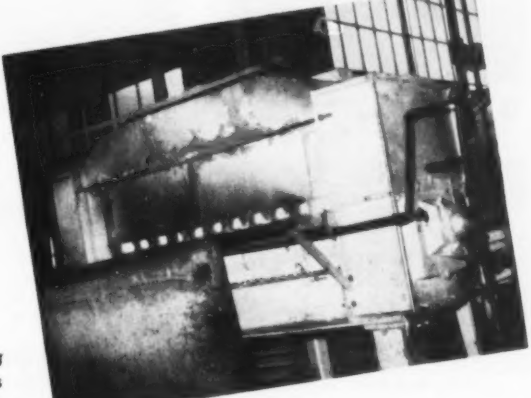
Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

*U. S. Patent #2184926 (other patents pending)

here's how TO GET LONGER LIFE FOR YOUR FORGE FURNACE LININGS

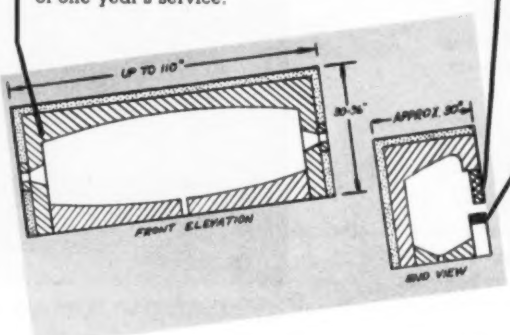


Taylor Sillimanite (TASIL) refractories prolong service life of 50 furnaces operated by an automotive parts manufacturer.

TASIL HYDROCAST—the hydraulic-setting castable refractory for service up to 3000° F.—is used to cast the backwall, end walls, burner openings and roof. Mix Hydrocast with water and pour in place like concrete—your special shapes are in the bag! TASIL Hydrocast main linings in these furnaces are giving a minimum of one year's service.

TASIL TILE are used for the front arch, where resistance to spalling from thermal shock or rapid heating is required. TASIL tile generally last from 2 to 6 months, depending on the severity of the furnace operation. This is 4 to 6 times the life of fireclay tile.

TAYCOR BRICK (90% Al_2O_3) were selected to form the bottom of the slot because of their excellent resistance to abrasion and attack from iron scale. Fire brick in this location had to be replaced weekly—TAYCOR brick average three months. Very little scale or slag stick to the TAYCOR brick and that which does cleans off easily.



CROSS SECTIONAL VIEWS OF FORGING FURNACE

- RAMMED CHROME ORE
- TASIL HYDROCAST #402
- TAYCOR BRICK
- TASIL TILE
- FIREBRICK OR INSULATING BRICK
- FIREBRICK

If your heavy-duty or high-speed heating and heat-treating furnaces still require too-frequent shutdowns for re-lining, investigate the advantages of Taylor Sillimanite. Write direct, or contact the Taylor Representative in your area, for recommendations on your furnace problem. No obligation, of course.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
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A SUBSIDIARY OF NATIONAL LEAD COMPANY
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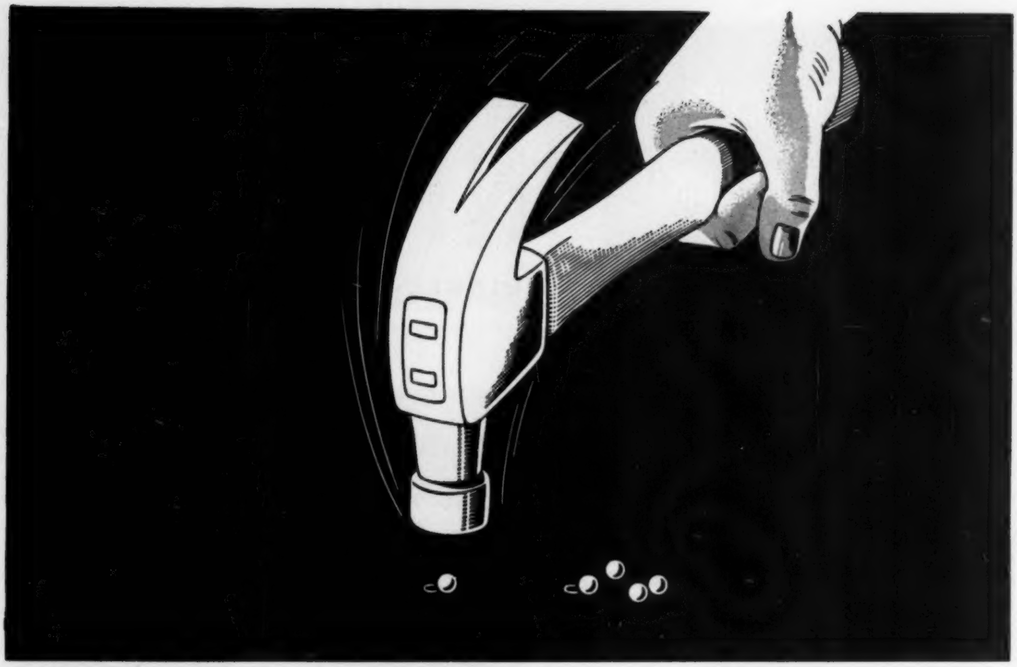

ARE YOU A *Betting Man?*

We would like to bet you a good lunch—that you can't take five pellets of the chilled iron shot you are now using and deform them, no matter how lightly you tap with your hammer. ALL OF THEM WILL SHATTER—NONE OF THEM WILL DEFORM.

Then we'd like to bet you another lunch that you can take five pellets of National Controlled "T" Shot and EVERY ONE OF THEM WILL DEFORM BEFORE TEARING APART.

The significance of these statements is obvious. National Controlled "T" Shot and Grit is the ONLY chilled iron abrasive in which the hard iron carbides (that do the cutting) are imbedded in a *ductile matrix*. Hard? Yes, indeed, hard enough to do a cleaning job as fast or faster, BUT soft enough to go easy on your equipment and to keep the shot from shattering as readily.

As a betting man, we'd like to prove our statements to you. The most you can lose is a lunch. And if we're telling the truth, you can gain substantial savings in your cleaning operations. What we suggest is such a quick and simple test, you can make it in a matter of minutes. Incidentally, if your blastcleaning operation requires the use of grit you will not be able to make this test—but remember, grit is made from shot, and a ductile matrix is even more important to a grit user, from a standpoint of holding down maintenance costs. Please write your name and address on the coupon below and mail it to the nearest Hickman-Williams office, and let us show you something *different* in chilled iron shot and grit.

H W
REG. U.S. PAT. OFF.

NATIONAL CONTROLLED "T" SHOT AND GRIT *IS PRODUCED EXCLUSIVELY BY*
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OK. Let's see you prove your point . . .

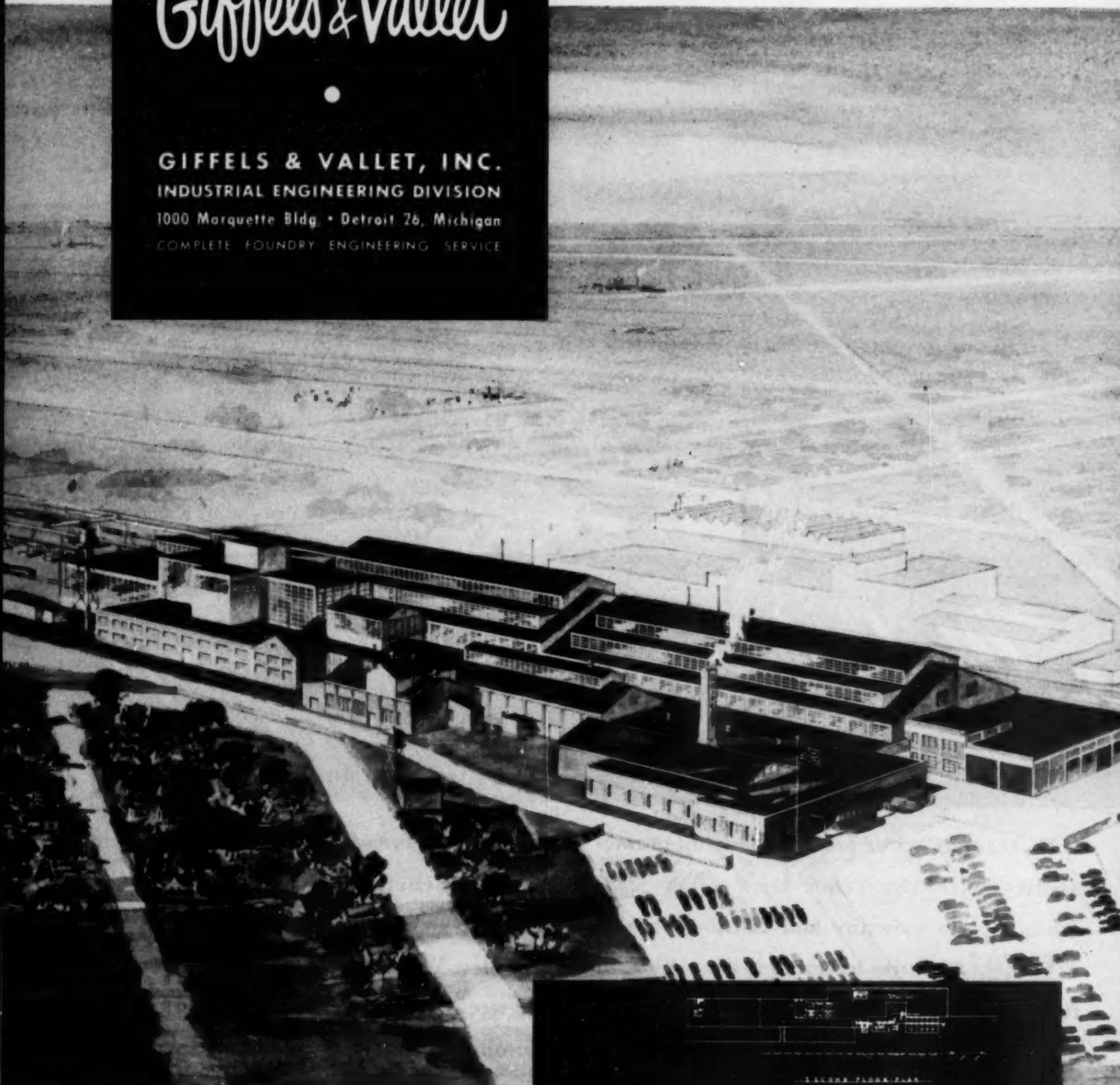
Name ______________________

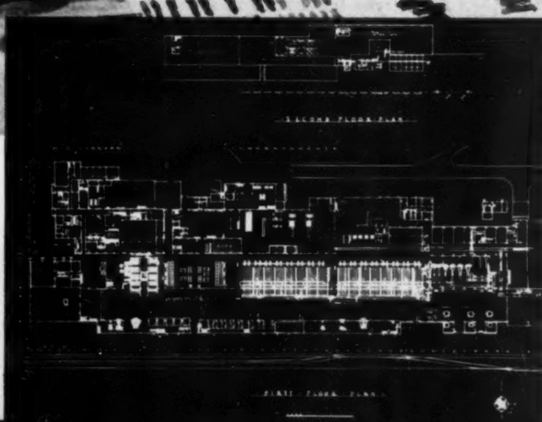
Firm ______________________

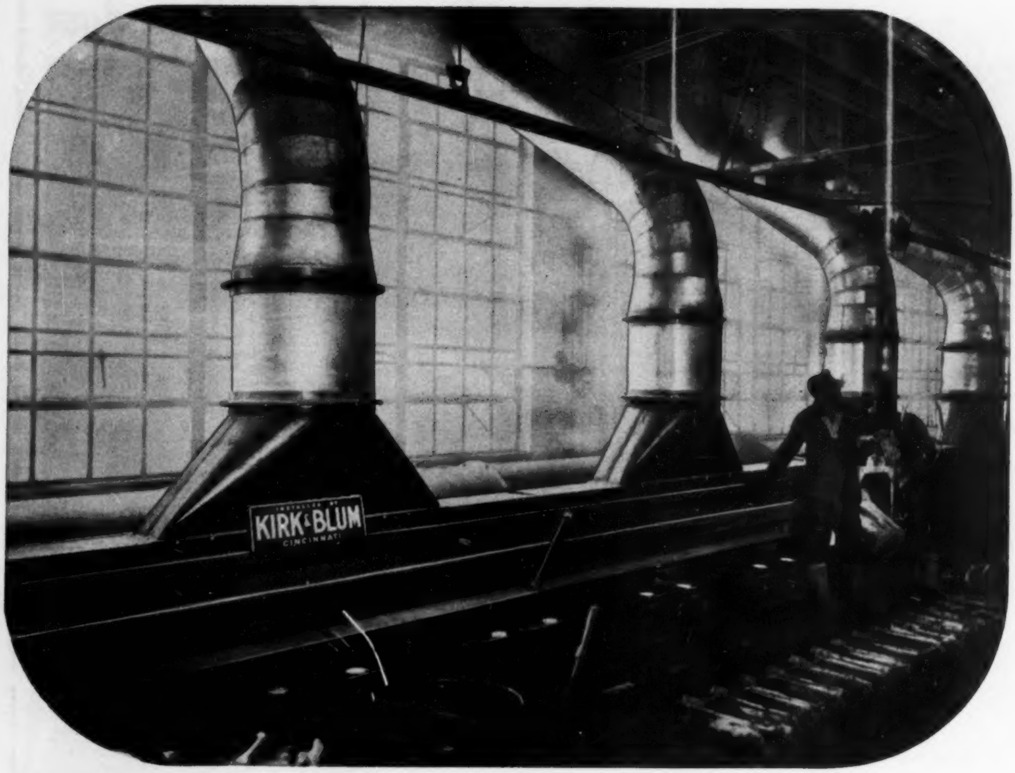
Address ______________________

City ______________________

MAIL TO HICKMAN, WILLIAMS OFFICE NEAREST YOU






KIRK & BLUM
CINCINNATI

PROGRESS REPORT ON NATIONAL CARBON BLAST FURNACE LININGS

TRADE-MARK

33 BLAST FURNACES lined with "NATIONAL" carbon have now produced over 1 million tons. Of these, 12 furnaces have produced more than 1½ million tons and 4 have passed the 2 million ton mark.

These tonnages are for *original linings.* In every case, production has been characterized by remarkably trouble-free operation.

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

In Canada: National Carbon Limited, Montreal, Toronto, Winnipeg

OTHER NATIONAL CARBON PRODUCTS

BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • SKIMMER BLOCKS • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS • TANK HEATERS

WHAT IS PRECISION CASTING?

ARE WE OVERWORKING the word "precision" in describing the various casting processes? We have run the gamut from permanent mold casting through die casting, plaster casting, investment casting—and now shell molding. Each in turn has labelled itself "precision casting." Are they all right, or are they all wrong? Where do the traditional sand casting processes fit into the picture?

Precision is defined as accuracy, which in turn is defined as "exact conformity with truth *or with some standard*." The last four words point the direction our inquiry should take. They seem to indicate that precision is a relative word whose actual meaning varies with the standards used to judge it.

To some, "precision casting" means the panacea for all their design problems. They interpret the words to mean availability of parts within final print limits with no machining required. In many cases such optimists may be disappointed if they have not adequately considered the standards by which precision must be measured.

What are the factors involved in selecting a casting or a process for producing it? First, is extreme accuracy necessary for the part involved? Will the casting be machined? If so, will a few thousandths more of metal actually be more difficult or cost to remove?

The importance of tolerances possible with a process is illustrated by statements such as: "Castings can be produced by this process to tolerances of $\pm$ 0.0015 in./in. These are in solid portions of die and will be greater if measured across parting lines. Minimum tolerance, $\pm$ 0.010 in." If the designer is thinking of a small casting about two inches in size, he must plan on $\pm$ 0.010 in. and not two times $\pm$ 0.0015 since this holds only for larger castings. If $\pm$ 0.010 will necessitate machining then what about a cheaper process which will add but little to the machining?

Since any "precision" part will demand a premium payment, is the accuracy obtained worth the additional cost?

What about the basic strength of the parts? Can strength be sacrificed for greater accuracy? For example, permanent mold and die castings will be stronger than shell molded castings of similar design and section size. Generally, sand castings will be stronger and more sound than investment castings.

What about size? There are definite limitations to the size of parts which can be produced by the various processes. At present, sand casting is the only process which is practically unlimited in size of parts produced.

How about shapes? Cored holes? Undercuts? These may limit the process which can be used or the tolerances obtainable.

Finally, what are the latest advances in techniques in the various fields of casting? Don't sell sand castings short as precision parts. Foundries now use extensively dry sand molds, skin dried molds, new high strength green sands. Don't forget also that a number of small parts can be rapidly and accurately produced in sand foundries by use of a matchplate pattern, whereas those parts could be made only singly or a few at a time by some of the other processes.

Examine all the methods. Check all the factors. Isn't precision relative? Then why not have precision sand castings as well as precision investment castings? Designers and foundrymen might well avoid the phrase "precision casting" unless it is accompanied by the name of the casting process.

Hiram Brown

HIRAM BROWN
Chief Metallurgist
Solar Aircraft Co.

Hiram Brown is chairman of the A.F.S. Aluminum & Magnesium Division, a member of four of the division's committees, and represents the Society on ASTM Committee B-7. His activities on behalf of the foundry industry include numerous technical talks before A.F.S. and other groups, and preparation of some 30 papers for a number of metals publications. He has written a book, Aluminum and Its Application, *and was author of the A.F.S. Exchange Paper to the Institute of British Foundrymen in 1950. Chief metallurgist for Solar Aircraft Co., Des Moines, Mr. Brown has had experience in all fields of casting light metals, copper-base, and nickel-base alloys, as well as welding and other forms of fabricating stainless steel and high temperature alloys. Graduated with high honors from Fenn College, Cleveland, he has worked for Aluminum Company of America, Frontier Bronze Corp., Niagara Falls, N. Y., and Aluminum Industries, Inc.*

TECHNOLOGY + NEW TOOLS to provide attractions for "EVERY FOUNDRY IN '52" *international* FOUNDRY CONGRESS & SHOW

GREATEST FOUNDRY SHOW ON EARTH, coupled with a seven-day program on the latest in castings technology makes the 1952 A.F.S. International Foundry Congress a "must" for "Every Foundry in '52."

Newest tools, supplies and services for the foundry industry will be housed in the huge Foundry Show, which will occupy the entire main floor and stage of Atlantic City's Convention Hall, largest Auditorium in the world.

Simultaneously, throughout the entire week of May 1 through 7, the technical program of the 1952 International Foundry Congress will feature latest developments in foundry technology and operating methods related by the world's outstanding foundrymen—authorities on every phase of metal casting.

Technical program will be closely scheduled by division interest so as to provide maximum opportunity for visiting foundrymen to attend sessions of particular interest to them in the shortest possible time. Thus all non-ferrous sessions, shop courses, round table luncheons, dinners and related events are scheduled for the first three days of the Congress, while ferrous sessions and activities will be largely confined to the last three days. General interest sessions, such as Plant & Plant Equipment, Costs, Timestudy & Methods, etc., are also primarily scheduled for the last three days.

Highlight events of the 1952 A.F.S. International Foundry Congress & Show will include the colorful Opening Day Ceremony, the A.F.S. Chapter Officers and Directors Dinner, Annual A.F.S. Business Meeting, Charles Edgar Hoyt Annual Lecture, Annual Banquet, Canadian Dinner, International Reception and International Educational Dinner.

Annual Business Meeting of the Society will feature the President's Annual *"State of the Society"* Address, Election of A.F.S. Officers and Directors, and presentation of first prizes to winners of the 1952 A.F.S. Apprentice Contest. Immediately following the Annual Business Meeting will be the year's top technical address, the Charles Edgar Hoyt Annual Lecture, to be given by John S. Bugas, Vice-President Industrial Relations, Ford Motor Co., who will discuss *"Frontiers in Industrial Relations."*

This year for the first time, the headline social event of the foundry year, the Annual Banquet, will feature the finest in professional entertainment instead of the customary speaker.

Two luncheon meetings which proved extremely popular last year, the Defense Production Luncheon Meeting and the Equipment & Supplies Luncheon, will again be held. The Defense Production Luncheon, which affords foundrymen an opportunity to discuss their problems with top National Production Authority officials, will be divided into two luncheons, one for non-ferrous foundrymen on May 1, and one for ferrous foundrymen May 5.

Remember the time and place—May 1 through 7 in Atlantic City—when the Greatest Foundry Show on Earth, plus a topnotch technical program will benefit "Every Foundry in '52."

Tentative program of events for the 1952 A.F.S. International Foundry Congress, and a partial listing of exhibitors in the concurrent A.F.S. Foundry Show will be found on Pages 32, 33 and 34 of this issue.

TWO U.S. TOURS SCHEDULED FOR OVERSEAS FOUNDRYMEN ATTENDING '52 INTERNATIONAL

ARRANGEMENTS for two concurrent tours of United States foundries for overseas International Foundry Congress visitors have been completed by A.F.S., working in conjunction with the Mutual Security Agency and Thos. Cook & Son travel agency. Planned so as to include the 1952 A.F.S. International Foundry Congress & Show in Atlantic City the week of May 1 through 7, the tours will both begin in New York on April 18 and end in New York May 14.

Included in the twin itineraries are visits to prominent foundries in the New York, Buffalo, Detroit, Cleveland, Chicago and Cincinnati areas, arranged by local A.F.S. chapters, and to Atlantic City the entire week of May 1 through 7.

As planned, the main tour party will sail on the S.S. Britannic from Liverpool, arriving in New York April 18. Following orientation sessions and sightseeing, the tours will go their separate ways—"Red" to Cleveland, Chicago and Cincinnati—and "Blue" to Buffalo, Detroit and Chicago, both meeting in Atlantic City May 1 through 7 for the International Foundry Congress. Tour "Red" will then go to New York for three days, and "Blue" to Pittsburgh for three days, joining again May 11 in Washington, D. C., for a tour of the Capitol and the city.

Main party will sail three days later from New York on the S.S. Queen Mary.

Overseas foundrymen planning to attend the 1952 International may obtain tour information from the secretarys of their respective member associations in the International Committee of Foundry Technical Associations, from OSR missions or American Embassies in their respective countries, local offices of Thos. Cook & Son, or from Tom Makemson, Secretary, Institute of British Foundrymen, who will make arrangements for sailing with the main tour party on the S.S. Britannic from Liverpool. Prospective tour members are requested to furnish information as to the type of operations they primarily desire to visit i.e., gray iron, malleable, steel, non-ferrous, etc.

SCHEDULE OF TOURS

Study Tour "Red"		Study Tour "Blue"
New York	Friday, April 18	New York
New York	Saturday, April 19	New York
New York	Sunday, April 20	New York
Cleveland	Monday, April 21	Buffalo
Cleveland	Tuesday, April 22	Buffalo
Cleveland	Wednesday, April 23	Detroit
Chicago	Thursday, April 24	Detroit
Chicago	Friday, April 25	Detroit
Chicago	Saturday, April 26	Chicago
Chicago	Sunday, April 27	Chicago
Chicago	Monday, April 28	Chicago
Cincinnati	Tuesday, April 29	Chicago
Cincinnati	Wednesday, April 30	Chicago
Atlantic City	May 1-7	Atlantic City
New York	Thursday, May 8	Pittsburgh
New York	Friday, May 9	Pittsburgh
New York	Saturday, May 10	Pittsburgh
Washington	Sunday, May 11	Washington
Washington	Monday, May 12	Washington
New York	Tuesday, May 13	New York
New York (Sail)	Wednesday, May 14	(Sail) New York

REVISED TENTATIVE SCHEDULE OF SESSIONS FOR

THURSDAY, MAY 1
"Defense Day"

8:30 am	Registration Begins
9:30 am	Exhibits Open
10:00 am	Non-Ferrous Founders' Society Open Meeting
11:45 am	*Official Opening Ceremony*
12:30 pm	Brass & Bronze Round Table Luncheon
	Defense Production Luncheon—Non-Ferrous
2:00 pm	Technical Session
	Aluminum & Magnesium
4:00 pm	Technical Sessions
	Aluminum & Magnesium
	Sand Shop Course—Non-Ferrous
5:30 pm	Exhibits Close
7:00 pm	Non-Ferrous Founders' Society "Son-Father" Dinner

FRIDAY, MAY 2
"Chapter Day"

9:00 am	Registration Opens
	Exhibits Open
9:30 am	Plant Visitation Groups Depart
10:00 am	Technical Sessions
	Aluminum & Magnesium
	Brass & Bronze
	Patternmaking
	Sand
12 noon	Round Table Luncheon Meetings
	Aluminum & Magnesium
	Patternmaking
2:00 pm	Technical Sessions
	Brass & Bronze
	Malleable
3:00 pm	Official A.F.S. Ladies Tea
4:00 pm	Sand Shop Course—Non-Ferrous
7:00 pm	*Chapter Officers & Directors Dinner*
9:30 pm	Exhibits Close

SATURDAY, MAY 3
"President's Day"

9:00 am	Registration Opens
10:00 am	*Annual A.F.S. Business Meeting*
	Election of Officers and Directors
	Apprentice Contest Awards
	Welcome to International Delegates
11:00 am	*Charles Edgar Hoyt Annual Lecture*
12 noon	Exhibits Open
	Defense Production Luncheon—Non-Ferrous
2:00 pm	Technical Sessions
	Aluminum & Magnesium
	Brass & Bronze
	Patternmaking
	International Committee Meeting
4:00 pm	Technical Sessions
	Malleable
	Safety & Hygiene & Air Pollution
5:30 pm	Exhibits Close
7:30 pm	*Annual Banquet*
	A.F.S. Gold Medal Awards
	International Award of Honor

SUNDAY, MAY 4
"International Day"

(Free Day for Employees of Plants in Chesapeake, Philadelphia and Metropolitan Chapter areas)

9:00 am	Registration Opens
10:00 am	Exhibits Open
	International Committee Meeting
	Testing Cast Iron
	A.F.S. Committee Meetings
12 noon	*International Committee Luncheon Meeting*—Foundry Defects
2:00 pm	International Committee Meeting
	A.F.S. Committee Meetings
4:30 pm	*International Reception*
6:30 pm	Exhibits Close
7:00 pm	*Canadian Dinner*

PARTIAL LIST OF FOUNDRY SHOW EXHIBITORS FOR

Accurate Match Plate Co., Inc.	Chicago.
Adams Co.	Dubuque, Iowa.
Advance Glove Mfg. Co.	Detroit.
Aerodyne Development Corp.	Cleveland.
Ajax Electrothermic Corp.	Trenton, N. J.
Ajax Engineering Corp.	Trenton, N. J.
Ajax Flexible Couplings Co., Inc.	Westfield, N. J.
Allis-Chalmers Mfg. Co.	Milwaukee.
Alpha-Lux Co., Inc.	New York.
American Air Filter Co., Inc.	Louisville.
American Clay Forming Co.	New York.
American Colloid Co.	Chicago.
American Fire Clay & Products Co.	Canfield, Ohio.
American Gas Association	New York.
American Lava Corp.	Chattanooga.
American Metal Market	New York.
American Refractories & Crucible Corp.	North Haven, Conn.
American Silica Sand Co.	Ottawa, Ill.
American Steel Abrasive Co.	Galion, Ohio.
American Wheelabrator & Equipment Corp.	Mishawaka, Ind.
Apex Smelting Co.	Chicago.
Archer-Daniels-Midland Co.	Cleveland, Ohio.
Asbury Graphite Mills, Inc.	Asbury, N. J.
Atlas Plastic & Aluminum Plate Co.	Butler, Wis.
Ayers Mineral Co.	Zanesville, Ohio.
Bakelite Co.	New York.
Bamber Foundry, Inc.	Stamford, Conn.
Baroid Sales Div., National Lead Co.	Chicago.
C. O. Bartlett & Snow Co.	Cleveland.
Bay State Abrasive Products Co.	Westboro, Mass.
Beardsley & Piper Div., Pettibone Mulliken Corp.	Chicago.
Black Sivalls & Bryson, Inc.	Kansas City, Mo.
Blaw-Knox Div. of Blaw-Knox Co.	Pittsburgh.
Bloomsbury Graphite Co.	Bloomsbury, N. J.
Borden Co.—Chemical Div.	New York.
Buckeye Tools Corp.	Dayton, Ohio.
Campbell-Hausfeld Co.	Harrison, Ohio.
Canton Chaplet & Mfg. Co.	Canton, Ohio.
Carborundum Co.	Niagara Falls, N. Y.
Chain Belt Co.	Milwaukee.
Chicago Pneumatic Tool Co.	New York.
Clearfield Machine Co.	Clearfield, Pa.
Cleco Div., Reed Roller Bit Co.	Houston, Tex.
Cleveland Flux Co.	Cleveland.
Cleveland Metal Abrasive Co.	Cleveland.
Cleveland Vibrator Co.	Cleveland.
Climax Molybdenum Co.	New York.
L. A. Cohn & Bro., Inc.	Chicago.
Colonial Smelting & Refining Co., Inc.	Columbia, Pa.

1952 A.F.S. INTERNATIONAL FOUNDRY CONGRESS

MONDAY, MAY 5
"Management Day"

8:00 am	**National Castings Council Annual Meeting**
9:00 am	**Exhibits Open**
	Registration Opens
10:00 am	**Technical Sessions**
	Gray Iron
	Steel
	Safety & Hygiene & Air Pollution
	Time Study & Methods
	Malleable
	Sand
	Foundry Educational Foundation Trustees Annual Meeting
12 noon	**Malleable Round Table Luncheon**
	Defense Production Luncheon Meeting—Ferrous
2:00 pm	**Technical Sessions**
	Educational (Chapter Educational Activities)
	Safety & Hygiene & Air Pollution
	Plant & Plant Equipment
2:30 pm	**Ladies International Tea & Style Show**
4:00 pm	**Technical Sessions**
	Gray Iron Shop Course
	Sand Shop Course—Ferrous
	Education
	Costs
	Plant & Plant Equipment
5:30 pm	**Exhibits Close**
7:00 pm	***Alumni Dinner*** **(By Invitation)**

TUESDAY, MAY 6
"Old Timers Day"

9:00 am	**Registration Opens**
	Exhibits Open
	Plant Visitation Groups Depart by Chartered Buses
10:00 am	**Technical Sessions**
	Gray Iron
	Heat Transfer
	Costs
	Education
	National Foundry Association Executive Council
	Ladies Sightseeing Trip & Luncheon
	Old Timers' Molding Contest
12 noon	**Gray Iron Round Table Luncheon**
	Equipment & Supplies Luncheon
2:00 pm	**Technical Sessions**
	Steel
	Time Study & Methods
	Refractories
4:00 pm	**Technical Sessions**
	Gray Iron Shop Course
	Sand Shop Course—Ferrous
5:00 pm	**Ladies Registration Ends**
5:30 pm	**Exhibits Close**
6:30 pm	***International Education Dinner***

WEDNESDAY, MAY 7
"Exhibitors' Day"

9:00 am	**Registration Opens**
	Exhibits Open
10:00 am	**Technical Sessions**
	Gray Iron
	Steel
	Sand
11:00 am	***Exhibitor Recognition and Award***
12 noon	**Steel Round Table Luncheon**
	President's Luncheon for FEMA and FFMA Officials
3:00 pm	**Registration Officially Ends**
4:00 pm	**Exhibits Officially Close**
	International Congress Ends

1952 A.F.S. INTERNATIONAL FOUNDRY CONGRESS

Corn Products Sales Co. .... Columbia, Pa.
Crane Co. .... Chicago.

Davenport Machine & Foundry Co. .... Davenport, Iowa.
Dayton Oil Co. .... Dayton, Ohio.
Debevoise-Anderson Co., Inc. .... New York.
Delaware Tool Steel Corp. .... Wilmington, Del.
Delta Oil Products Co. .... Milwaukee.
Wm. Demmler & Bros. .... Kewanee, Ill.
Detroit Electric Furnace Div., Kuhlman Electric Co. .... Bay City, Mich.
Detroit Sheet Metal Works .... Detroit.
DeWalt, Inc. .... Lancaster, Pa.
Harry W. Dietert Co. .... Detroit.
Dings Magnetic Separator Co. .... Milwaukee.
Dispatch Oven Co. .... Minneapolis.
Joseph Dixon Crucible Co. .... Jersey City, N. J.
DoALL Co. .... Des Plaines, Ill.
Dougherty Lumber Co. .... Cleveland.
Durez Plastics & Chemicals, Inc. .... North Tonawanda, N.Y.

Eastern Clay Products, Inc. .... Jackson, Ohio.
Eastman Kodak Co. .... Rochester, N.Y.
Electro Metallurgical Co., A Division of Union Carbide & Carbon Corp. .... New York.
Electro Refractories & Abrasives Corp. .... Buffalo.
Exomet, Inc. .... Conneaut, Ohio.
Exothermic Alloys & Service, Inc. .... Chicago

Fabreeka Products Co. .... Boston.
Fanner Mfg. Co. .... Cleveland.
Federal Foundry Supply Co. .... Cleveland.
Federated Metals Div., American Smelting & Refining Co. .... New York.
The Foundry, Penton Publishing Co. .... Cleveland.
Foundry Educational Foundation .... Cleveland.
Foundry Equipment Co. .... Cleveland.
Foundry Equipment Mfrs. Association, Inc. .... Cleveland.
Foundry Facings Manufacturers Assn. .... Pittsburgh.
Fox Grinders, Inc. .... Pittsburgh.
Foxboro Co. .... Foxboro, Mass.
Freeman Supply Co. .... Toledo, Ohio.
Fremont Flask Co. .... Fremont, Ohio.

General Electric Co., Chemical Div. .... Pittsfield, Mass.
General Electric Co., X-Ray Dept. .... Milwaukee.
General Grinding Wheel Corp. .... Philadelphia.
General Refractories Co. .... Philadelphia.
Girdler Corp., Thermex Div. .... Louisville.
Globe Steel Abrasive Co. .... Mansfield, Ohio.

(Continued on Following Page)

PARTIAL LIST OF EXHIBITORS

(Continued from Preceding Page)

Gray Iron Founders' Society....Cleveland.
Great Lakes Carbon Corp....St. Louis.
Great Lakes Foundry Sand Co....Detroit.
Samuel Greenfield Co....Buffalo.

Harbison-Walker Refractories Co....Pittsburgh.
Harnischfeger Corp....Milwaukee.
Benj. Harris & Co....Chicago Heights, Ill.
Harrison Abrasive Div., Metals Disintegrating Co., Inc....Manchester, N.H.
Harrison Machine Co....Wesleyville, Erie, Pa.
Herman Pneumatic Machine Co....Pittsburgh.
Hewitt-Robins, Inc....New York.
Hickman, Williams & Co....Philadelphia.
Hill & Griffith Co....Cincinnati.
Hines Flask Co....Cleveland.
Frank G. Hough Co....Libertyville, Ill.
E. F. Houghton & Co....Philadelphia.
Hydro-Blast Corp....Chicago.

Induction Heating Corp....Brooklyn, N. Y.
Industrial Fabricating, Inc....Eaton Rapids, Mich.
Industrial Minerals Co....Lancaster, Ohio.
Ingersoll-Rand Co....New York.
International Graphite & Electrode Corp....St. Marys, Pa.
International Molding Machine Co....LaGrange Park, Ill.
International Nickel Co., Inc....New York.
Iron Age....New York.
Iron Lung Ventilator Co....Cleveland.

Jeffrey Manufacturing Co....Columbus, Ohio.
William F. Jobbins, Inc....Aurora, Ill.
Johnson-March Corp....Philadelphia.
Joy Manufacturing Co....Pittsburgh.

Kindt-Collins Co....Cleveland.
Andrew King....Narberth, Pa.
Lester B. Knight & Associates, Inc....Chicago.
H. Kramer & Co....Chicago.
Chas. A. Krause Milling Co....Milwaukee.
Kwik-Mix Co....Milwaukee.

Lava Crucible Co. of Pittsburgh....Pittsburgh.
R. Lavin & Sons., Inc....Chicago.
Leeco Products....Detroit.
Lindberg Engineering Co., Fisher Furnace Div....Chicago.
Linde Air Products Co....New York.
Link-Belt Co....Chicago.

Macklin Co....Jackson, Mich.
Macleod Co....Cincinnati.
Magie Brothers....Chicago.
Manley Sand Co....Rockton, Ill.
Martin Engineering Co....Kewanee, Ill.
Master Pneumatic Tool Co., Inc....Cleveland.
Mathews Conveyer Co....Elwood City, Pa.
Mechanical Handling Systems, Inc....Detroit.
Michigan Smelting & Refining Div. of Bohn Aluminum & Brass Corp....Detroit.
Mine Safety Appliances Co....Pittsburgh.
Modern Equipment Co....Port Washington, Wis.
Monk Tool Co....Geneva, Ill.
Monsanto Chemical Co....St. Louis.
The Moulders' Friend....Dallas City, Ill.
Multiplex Machinery Corp....Elmore, Ohio.

Nassau Smelting & Refining Co., Inc....Staten Island, N. Y.
National Carbon Co., A Division of Union Carbide & Carbon Corp....New York
National Crucible Co....Philadelphia
National Engineering Co....Chicago.
National Foundry Association....Chicago.
National Pigment Co....Philadelphia.
National Pulverizing Co....Millville, N. J.
Newaygo Engineering Co....Newaygo, Mich.
New Jersey Silica Sand Co....Millville, N. J.
Niagara Falls Smelting & Refining Div., Continental Copper & Steel Industries....Buffalo.
Wm. H. Nichols Co., Inc....Richmond Hill, N. Y.
Nichols Engineering & Research Corp....New York.
Non-Ferrous Founders' Society....Chicago.
North American Smelting Co....Wilmington, Del.
Norton Co....Worcester, Mass.

S. Obermayer Co....Chicago.
Ohio Crankshaft Co....Cleveland.
Ohio Ferro-Alloys Corp....Canton, Ohio.
Oliver Machinery Co....Grand Rapids, Mich.
Osborn Manufacturing Co....Cleveland.

Pangborn Corp....Hagerstown, Md.
Pekay Machine & Engineering Co....Chicago.
Pennsylvania Foundry Supply & Sand Co....Philadelphia.
Pennsylvania Glass Sand Corp....Pittsburgh.
Penola Oil Co....Detroit.
George F. Pettinos, Inc....Philadelphia
Philadelphia Coke Co....Philadelphia.
Pittsburgh Crushed Steel Co. & Subsidiaries....Pittsburgh.
Pittsburgh Lectromelt Furnace Corp....Pittsburgh.
Precision Grinding Wheel Co., Inc....Philadelphia.
Pressure Match Plate Co., Inc....Philadelphia.
Pyrometer Instrument Co., Inc....Bergenfield, N. J.
Pyro Refractories Co....Oak Hill, Ohio

Ready-Power Co....Detroit.
Reda Pump Co....Bartlesville, Okla.
Redford Iron & Equipment Co....Detroit.
W. G. Reichert Engineering Co....Newark, N. J.
Republic Coal & Coke Co....Chicago.
H. H. Robertson Co....Pittsburgh.
Robinson Clay Product Co....Akron, Ohio
Ross-Tacony Crucible Co....Philadelphia.
Royer Foundry & Machine Co....Kingston, Pa.

Safety Clothing & Equipment Co....Cleveland.
George Sall Metals Co....Philadelphia.
Claude B. Schneible Co....Detroit.
A. Schrader's Son, Division of Scoville Mfg. Co....Brooklyn, N. Y.
Schramm, Inc....West Chester, Pa.
Scientific Cast Products Corp....Cleveland.
Semet-Solvay Div., Allied Chemical & Dye Corp....New York.
Severance Tool Industries, Inc....Saginaw, Mich.
Simonds Abrasive Co....Philadelphia.
Simplicity Engineering Co....Durand, Mich.
Smith & Richardson Mfg. Co....Geneva, Ill.
Solvay Sales Div., Allied Chemical & Dye Corp....New York.
Spencer Turbine Co....Hartford, Conn.
Spo, Inc....Cleveland.
Springfield Facing Co....Harrison, N. J.
Standard Electrical Tool Co....Cincinnati.
Standard Horse Nail Corp....New Brighton, Pa.
Steel Shot & Grit Co., Inc....Boston.
Steel Shot Producers, Inc....Butler, Pa.
Sterling Wheelbarrow Co....Milwaukee.
Frederic B. Stevens, Inc....Detroit.
Sutter Products Co....Dearborn, Mich.
Swan-Finch Oil Corp....New York.

Tabor Manufacturing Co....Philadelphia.
Taggart Brimfield Co....Hammonton, N. J.
G. H. Tennant Co....Minneapolis.
Thiem Products, Inc....Milwaukee.
Titanium Alloy Mfg. Div., National Lead Co....New York.
Toledo Scale Co....Toledo, Ohio.

United Oil Mfg. Co....Erie, Pa.
United States Graphite Co....Saginaw, Mich.
United States Gypsum Co., Industrial Div....Chicago.
United States Rubber Co., Mechanical Goods Div....New York.

Vanadium Corp. of America....New York.
Vesuvius Crucible Co....Pittsburgh.
Vonnegut Moulder Corp....Indianapolis.

Westover Engineers—Nomad Foundry Equipment Div....Milwaukee.
Whitehead Brothers Co....New York.
White Pine Lumber Co....Chicago.
Whiting Corp....Harvey, Ill.

Zanesville Sand Co....Zanesville, Ohio.

Install Twelfth A.F.S. Student Chapter at University of Michigan

NUMBER 12 in the growing list of A.F.S. Student Chapters, the University of Michigan, will become a member of the A.F.S. family at official installation ceremonies to be held on the University campus at Ann Arbor February 27. A.F.S. National Secretary-Treasurer Wm. W. Maloney will welcome the Chapter with presentation of the traditional cast iron rattle.

Some 46 students petitioned the National Office in December for permission to start the Student Chapter, and this was approved by the A.F.S. Board of Directors in January. Headed by Faculty Advisors R. A. Flinn and G. A. Conger, six faculty members have joined the Chapter: C. W. Philips, W. A. Spindler, Clarence Upthegrove and William Pierce.

Officers of the Chapter are: President Raymond Decker, metallurgical engineering student; Vice-President Philip Lunetta, mechanical engineering student; Secretary A. J. Terry Brown, Jr., Chemical and metallurgical engineering student; and Treasurer Sumio Yukawa, graduate metallurgical student. Other members of the Student Chapter are:

Gopal Argwal, Kirk Buddington, Robert S. Carey, Carl A. Corneliuson, Ricardo Cortes, Larry De Boer, Raymond Decker, David Guttentag, John Harris, A. J. Hayes, Anthony Kudela.

Paul Malloy, Leonard Martin, Jr., James Pappos, Richard A. Pereles, Michael A. Roman, Jr., John P. Rowe, Harold E. Surface, H. M. Smith, R. L. Sonnenberg, William H. Strickler, J. F. Watson, R. P. Wegter, D. Weigel, D. B. Wile.

S. L. McComb, John C. Shyne, Arthur W. Donkin, Joseph Datsko, Paul A. Newcombe, Albert W. Demmler, Jr., and James Woodard.

Michigan State College to Sponsor Ventilation Meeting February 25-28

FOUR-DAY CONFERENCE on industrial ventilation will be held at Michigan State College, East Lansing, beginning February 25 and continuing through February 28. Program of the conference, a joint enterprise of the Division of Industrial Health, Michigan Department of Health and Michigan State College's Mechanical Engineering Department, is as follows:

Monday, February 25

8:30 am Registration.
10:00 am General Session. *"How Modern Manufacturing Affects Industrial Ventilation"* and *"Control Must Be Engineered."*
12:00 noon Luncheon.
1:30 pm General Session. *"Principles of Hood Design."*
3:45 pm Selection of Classes.
7:30 pm General Interest Films.

Tuesday, February 26

8:30 am General Session. *"Evaluation of Exhaust Systems."*
9:45 am Classes.
11:30 am Luncheon.
1:00 pm General Session. *"Piping Design."*
2:00 pm Classes.
6:00 pm Dinner.

Wednesday, February 27

8:30 am General Session. *"Fans—Their Limitations and Uses."*
10:15 am Classes.
11:30 am Luncheon.
1:00 pm General Session. *"Description, Application and Efficiency of Collectors."*
2:00 pm Classes.
6:30 pm Banquet.

Thursday, February 28

8:30 am General Session. *"Air Supply—Its Importance and Economy."*
9:45 am Classes.
12:00 noon Luncheon. Conference Closes.

Mailing Stickers, Posters Publicize 1952 A.F.S. Foundry Congress & Show

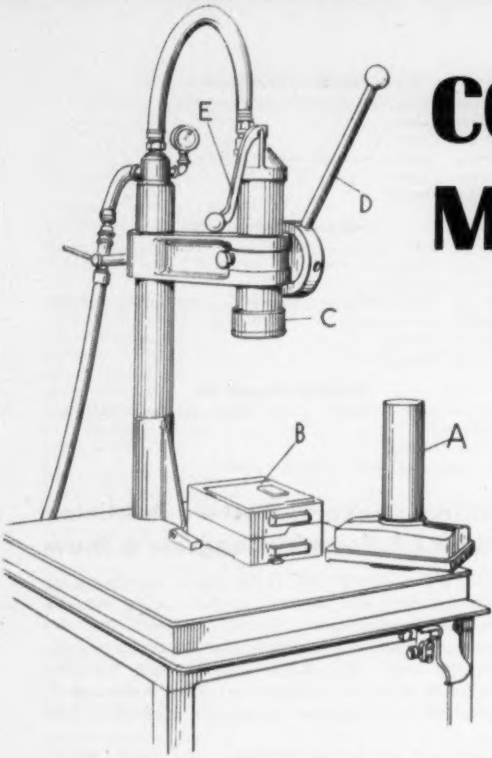
"EVERY FOUNDRY IN '52" is the slogan appearing on mailing stickers and posters currently being used by American Foundrymen's Society chapters and by foundry equipment and supply manufacturers to publicize the huge 1952 A.F.S. International Foundry Congress & Show in Atlantic City, May 1 through 7.

Some 200,000 gummed three-color stickers, a full-

size replica of which is shown here, are being used by the nation's leading foundry equipment and supply firms on their daily correspondence with foundrymen all over the country to call attention to their participation in the gigantic Foundry Show, expected to be the greatest display of new tools for the foundry industry in history.

Placards bearing the legend "Welcome World Foundrymen" have been supplied to all A.F.S. Chapters for display at every meeting. In addition, each Chapter and all A.F.S. company and Sustaining Member plants are being supplied with Foundry Congress posters for meeting and plant display.

Additional correspondence stickers are available to all exhibitors at the 1952 Foundry Show by writing A. A. Hilbron, A.F.S. Convention & Exhibits Manager, 616 S. Michigan, Chicago 5, Ill.



COREBLOWING MACHINES—

What They Can Do for Your Foundry

Fig. 1—Bench blower. Operator fills head (A) with sand. Attached to head's lower end is blow plate with hole pattern matching that of box (B). Head is placed on top of box and both are positioned beneath cylinder (C). Lever (D) presses cylinder down on head and box, sealing connections, while valve (E) releases air pressure, forcing sand into the box.

John A. Mescher
Core Room Foreman
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A core blowing machine operating only 2 or 3 hours a day will save enough to amortize its cost long before it is worn out. Foundries with approximately 5 per cent of their business in the form of production runs can undoubtedly profit by the installation of a good blow machine. This paper outlines the basic facts of core blowing and discusses the advantages and limitations of this modern method of making sand cores.

Core blowing machines have been in existence for about 40 years and have proven their value in all branches of the foundry industry. But many small and medium-sized foundries that could use them to good advantage have as yet to purchase their first core blower.

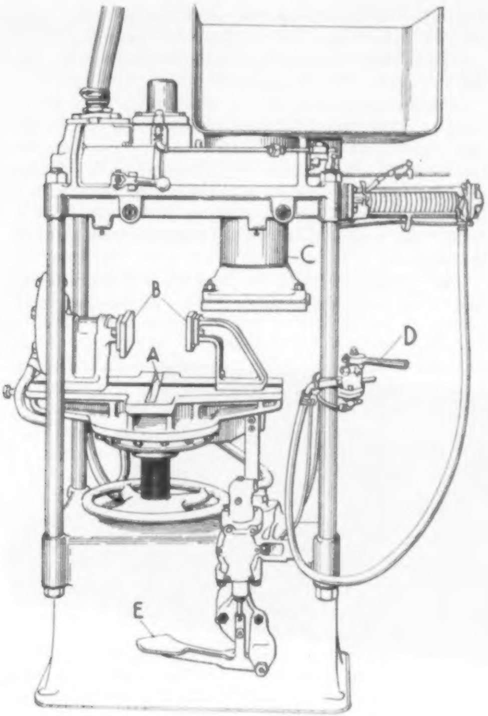
The fundamental principle involved in core blowing is very simple. Sand is introduced into the core box by air pressure instead of by jolting or ramming. The core blowing machine forces the sand, suspended in a stream of air, into a box equipped with vents which allow the air to escape but trap the sand grains in a mass sufficiently solid for all ordinary purposes. The time required to fill the box is short, seldom exceeding 2 seconds.

Three Major Types of Blow Machines

Blow machines are available in a large variety of sizes and styles. The three basic types are described here. There are other types, most of which are designed to handle just a few specialized jobs in high production. Figure 1 shows a small, portable, bench blower which can blow about 4 lb of sand in one shot. It can be set up quickly and is quite suitable for long or short runs of small cores. The blower in Fig. 2 is most frequently used in small or medium-sized foundries. It is simple in design, ruggedly built, easy to operate, and can deliver about 30 lb of sand in one blow. In Fig. 3 is shown a larger machine designed to accommodate boxes too large and heavy to be handled by one man. It can blow cores weighing up to 80 lb.

When using the bench blower (Fig. 1) the operator first fills the head with sand from his bench. Attached to the lower end of the head is a blow plate with a pattern of holes which match the holes in the top of the box to be blown. The operator places the head on top of the box, and both are positioned beneath the cylinder. The lever is then used to press the cylinder down upon the head and the box, thus sealing all connections, while the valve releases the air pressure necessary to force the sand into the box. The core is drawn in the usual manner.

To blow a core with the machine shown in Fig. 2 the operator places the box on the table between the jaws. Here, a vertically split box is assumed used. In the position shown, the blow head receives sand from the hopper above it, which in turn is filled by shoveling or by means of a chute. By turning the hand lever, the blow head moves to the left, directly above the box. The operator steps on the foot pedal and the following then happen in rapid succession: the jaws clamp the box firmly, sealing the vertical parting; the table rises and presses the box against the bottom of the blow plate, sealing the top opening; and the sand



🡅 *Fig. 2—In blowing core with machine shown, box is placed on table (A) between jaws (B), a vertically split box being used. Blow head (C) receives sand from hopper above it. When hand lever (D) is turned, blow head moves to left, directly above box to be blown. Operator then steps on foot pedal (E) and, successively, jaws clamp box, sealing vertical parting; table rises, pressing box against bottom of blow plate, and sealing top opening; sand and air are forced into box through holes in blow plate. Operator then removes foot from pedal and cycle is reversed—air pressure is shut off, table and box are lowered, and the clamps are released.*

and air are forced into the box through the holes in the blow plate. The operator then removes his foot from the pedal and the cycle is reversed: the air pressure is shut off; the table and the box are lowered; and the clamps are released.

For accelerated production this machine can be operated by two men. In such an arrangement each operator has his own box and works independently, one with his bench to the right of the machine, the other to the left. While one operator is using the machine, the other is at his bench drawing his box, applying the drier or core plate, and placing it in the oven. They do not interfere to any extent with each other because the time at the machine is considerably less than the time required for the other operations.

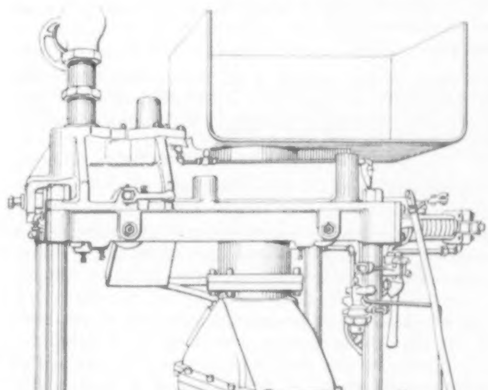
The operation of the large machine (Fig. 3) is similar, except that horizontally split boxes are usually used, with the top half of the box attached to the blow plate. After the core has been blown, the cylinder comes into operation, drawing the top half of the box. The bottom half is then rolled out of the machine into a cradle (not shown) where, after applying a drier or core plate, it is rolled over and drawn automatically. This machine eliminates most of the work of making large cores.

Installation Costs Are Moderate

The price of blow machines varies from about $475 for the bench blower to about $3,100 for the large machine. Installation costs are moderate, the only requirement being an air line carrying a pressure of about 100 psi. A ¾ in. line for the bench blower and a 2 or 3 in. line for the large machine is quite satisfactory. If several machines are connected to the same line, it is wise to have an air reservoir at each to maintain pressure.

Maintenance costs are very moderate, provided the machines are given proper care. They should give good service for at least 15 or 20 years. Certain parts

🡇 *Fig. 3—Operation of large machine is similar to that shown in Fig. 2, except that horizontally split boxes are usually used, with top half of box attached to blow plate. After core is blown, cylinder comes into operation, drawing top of box. Bottom of box is rolled out of machine into a cradle, where, after core plate or drier is applied, it is rolled over and bottom half of box is drawn automatically from the core, eliminating much difficult work.*



will have to be replaced periodically, of course, a condition which holds for all foundry equipment.

The most important maintenance factor by far is cleanliness. All parts which come in contact with the sand will receive a thin coating of core oil. In a short time this film will begin to oxidize to a thin crust, which is hard to remove. If the machine is used again without being cleaned, a second layer of oil and perhaps a little sand are deposited on the first layer, and before long the build-up of oil and sand causes trouble. To avoid this it is well to require each operator to clean his machine after each eight-hour shift.

Proper adjustment is also important. If the clearance between the top of the box and the blow plate is too large, proper sealing of all the surfaces is not obtained, with the inevitable result that air and sand leaks will cause rapid cutting of the parts exposed.

Blow Boxes Can Be Wood or Metal

Although cast iron blow boxes are unquestionably the most durable, their weight makes them difficult to handle. Where the top of the box is fastened to the machine (Fig. 3) and the lower half of the box is rolled over in a cradle, this weight causes no difficulty. Where a box must be lifted by the operator, however, and this in most foundries means better than 90 per cent of the jobs, the aluminum box is the most desirable. To increase its life, steel stripping may be used at the parting; steel inserts or sleeves should be used in the sand entrance holes; and replaceable steel wear plates may be used in the bottom of the box directly below the sand entrance holes, where the wear is most pronounced. In this way the life of an aluminum box may be extended to perhaps 200,000 or more blows.

Wooden boxes, particularly if they are open at the bottom so that the sand blows against a plate rather than wood, may be used for runs of several hundred cores before refinishing.

The arrangement of sand entrance holes and vents in a blow box is very important. No hard and fast rules can be laid down, but in general it is good practice to put the sand entrance holes over the deepest parts of the box as well as over any sections which are somewhat isolated from the main body of the core. Due to its inertia, sand in a blow box does not travel readily around corners. Hence the importance of placing the entrance holes properly.

In some cases, however, it is impractical to put a sand entrance hole in certain remote parts of the box, and a soft core at these spots results. This difficulty can be eliminated usually by introducing one or more vents at the point in question. Since the sand enters the box suspended in a stream of air, it will tend to follow this stream as it escapes from the box through the vents.

The volume of sand in the blow head limits the size of the core that can be blown on any machine. Depending on the number and arrangement of blow holes, a maximum of approximately half the sand in the head can be discharged in a single blow. If in any particular job the box does not fill completely in one blow, additional blow holes in those portions of the blow plate which previously had none will usually serve as a solution.

The size of the blow holes will in general be determined by the size of the box. Holes less than $\frac{3}{8}$ in. in diameter are apt to plug up rather easily, while on the other hand holes more than 1 in. in diameter result in excessive wear at the bottom of the box directly beneath them. This is especially true if the box is not particularly deep. The writer suggests that for cores weighing about 5 lb, the box be equipped with 4 blow holes each $\frac{1}{2}$ in. in diameter. For larger cores, the number and size will of course be increased, keeping in mind that the volume of sand transmitted through a blow hole is proportional to the square of its diameter.

Two kinds of vents are in general use, the slotted vent and the screened vent. Screen vents pass 3 or 4 times as much air as slotted vents of the same diameter, but have a tendency to bow down and leave a slight lump on the core. The slotted vent holds its shape better and lasts longer but is more difficult to keep clean. In general the writer has found it good practice to use the screen vent on print sections of the core as well as in those sections of the box where maxi-

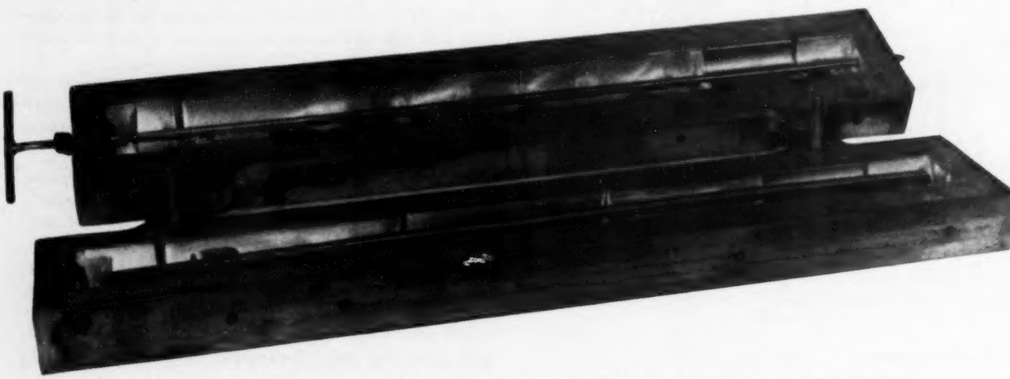


Fig. 4—Long blow box with provision for both rodding and venting 30-in core.

mum venting is needed and a minimum of space is available for the vents. Slotted vents are used on sections of the core which form the finished casting.

As to the number and size of vents needed, good practice is to maintain a ratio of total vent area to total blow hole area of about 6 to 1 in the case of the slotted vent, and about 2 to 1 for screen vents. Increasing this ratio does no harm, but dropping considerably below it will result in soft cores.

Reinforcing rods or wires may be placed on small pillars with a V-shaped notch at the top, or they may be supported by 2 or 3 pinches of core sand placed in the bottom of the box. In some cases the design of the box permits rods to be supported by the print section of the box. Venting a long blown core may be accomplished by inserting a smooth steel rod through a closely fitting sleeve in the wall of the box, blowing the core, and then removing the rod before the core is drawn from the box. Figure 4 shows a long blow box for a core 30 in. long, which has provision for both rodding and venting.

If such a vent rod must be placed directly below one or more blow holes, its position should be varied each day by twisting it and inserting it to different lengths. In this way the wear on the rod occasioned by the blow stream will be distributed over a larger area and the life of the rod prolonged.

Care of Blow Boxes

The cost of a blow box will in general be considerably more than the cost of the same box when used on the bench because of the precision with which it must be made and the time required to rig it properly.

Cleanliness in operation and regular inspection by the pattern shop are necessary if the full life of the box is to be realized. Any sand left at the parting of the box when it is placed in the machine will let air escape through the parting, carrying with it only a little of the finer materials in the mix. Soon the larger sand grains will escape, with the result that the parting will be severely cut in a relatively short time. It is a good idea to perform a regular cleaning operation

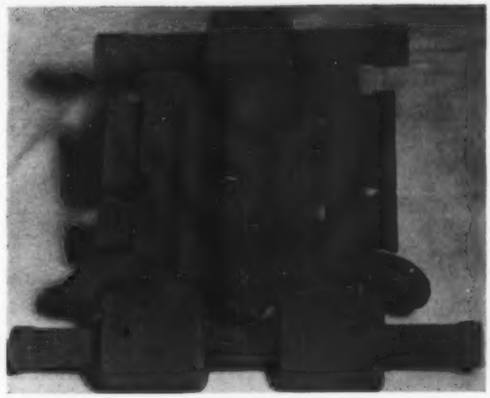


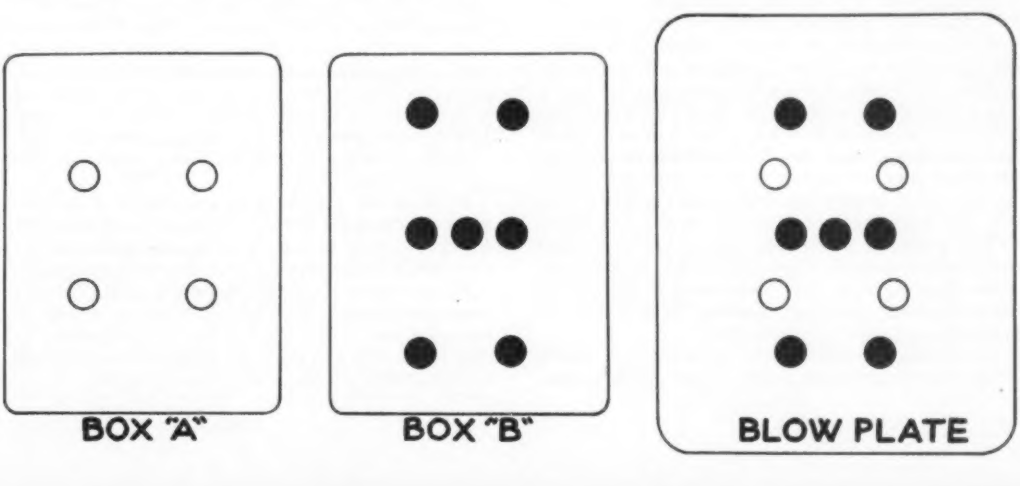
Fig. 5—One-piece core made on blow machine, eliminating splitting of sections, pasting and mudding.

after each blow, such as brushing off the parting or cleaning it with an air hose. This will slow down production slightly, but it will increase the life of the equipment many times.

It is equally important to keep the vents clean, for failure to do so will result in cores with soft spots; the increased back pressure will also increase the likelihood of leaks. For cleaning slot vents, an effective tool may be made from a 6 in. section of hack saw blade with one end pointed and ground down to about ¼ of its former thickness. For screen vents, the application of a concentrated solution of sal soda and the use of an air hose is satisfactory. Sal soda should not be used on wooden boxes, however, as it is likely to attack the finish.

Maintenance of a core blowing box consists principally of replacing worn vents and sand entrance hole sleeves. Wear plates used directly beneath blow holes must also be renewed occasionally. The parting of the box can be kept in good shape by lapping with valve

Fig. 6—This universal blow plate eliminates need for setting up blow plates for each new job. Two boxes shown can be interchanged without loss of time because each has solid flat top covering all holes except those conforming to its own pattern; wear plates index properly with pattern of own holes.



Author John Mescher (right) examining wooden core box used in blow machine. Note vents in front section. Box is open at bottom—recommended practice for lengthening short life of wooden core boxes. Several hundred cores can be blown by this type box.

grinding compound or similar abrasive. The same is true of the top surface of the box. The important thing is to prevent leaks by keeping surfaces which must be sealed at the time of blowing in such good condition that solids never escape through them.

No special sand mixes are required for the blow machine. However, these points deserve consideration:

1. Rounded-grain sand flows better and cuts the box less than angular-grain sand.
2. Permeability should be kept as high as possible to facilitate escape of air through sand to vents.
3. Moisture should be kept on the low side to eliminate sticking in the box.

Advantages of Core Blowing

The advantages of making cores on the blow machine instead of on the bench are:

1. High speed, therefore low cost, of production is achieved.
2. Uniformly high quality cores are produced.
3. Shapes extremely difficult, if not impossible, to make on the bench can be blown.
4. Paste work is practically eliminated.
5. Relatively unskilled workers can be used.
6. It is frequently possible to combine several cores which would have to be made separately on the bench.

The time required to get the sand into the box is never more than a second or two on the blow machine, whereas it might easily be five minutes or more when the same core is made on the bench; on the average, the direct core-making cost of blown cores is less than ⅓ the cost of bench-made ones. Consequently it does not take long to amortize the cost of box and driers.

The quality of blown cores will be uniformly high if the box is properly rigged, if the sand is good, and if the vents are kept clean. Under these conditions the under-ramming and over-ramming often found on hand-rammed cores are eliminated.

Cores can be made on the blow machine which would be difficult or impossible on the bench because sand can easily be blown into narrow or irregular parts of the box where it would be impossible to pack it with a stick. The designing engineer can set up jobs in a way which would be impossible if he were limited to hand-rammed cores. This reduces costs in the molding departments as well as in the core room.

The elimination of practically all paste work is a very important item. Cores which, when made on the bench, have to be split into 2 or more sections and then pasted and mudded, can usually be made in one piece on the blow machine. The cost of assembling these cores is eliminated, and the casting looks better.

The use of relatively unskilled workers on the blow machine is still another means of reducing the overall cost of operating the core room. It takes only a few weeks to turn an inexperienced man into a passably good blow machine operator. Important too is the fact that in times of high production the supply of unskilled help is always greater than the supply of skilled.

Limitations of Core Blowing

Very stiff sands are hard to blow. Sands whose green compression is more than 4 or 5 psi will form craters (like inverted cones) in the head of the machine above each blow hole, and will not feed down properly. Another limitation on sands for blow machines is that their permeabilities must not be too low. Sands with too high a percentage of fine material prevent the proper escape of air through the vents of the box at the time of blowing, and soft spots in the core result. For castings with extremely heavy metal sections (which require cores of low permeability), the blow machine is at a disadvantage.

A third objection to core blowing is the relatively high cost of good blow boxes. This objection is perfectly valid when the anticipated total production on the job is only a few hundred. But as the number of castings required increases, the extra initial cost of blow equipment becomes less and less important. The same thought applies to the heavy initial expense involved in the purchase of the large number of driers required to keep a job in continuous production.

A final limitation is the considerable time required to set up the machine for each job. This obviously is of no consequence in the case of long-run jobs, and can be minimized on short-run jobs by combining two or more jobs on the same blow plate. This is illustrated in Fig. 6. In production these two boxes could be interchanged without any loss of time because each has a solid flat top which covers all the holes in the blow plate except those conforming to its own pattern, and because the wear plates on the bottom of each box are so dimensioned as to cause it to index properly with its own pattern of holes. Thus anywhere from 2 to 6 or 8 boxes may be blown after setting up the machine just once.

In brief, the core blowing machine is a modern, efficient high speed method of making good cores. For a small jobbing foundry with limited quantities on each job, it is a needless expense. But if approximately 5 per cent or more of the business is in the form of production runs, if the blow machine can be kept in operation only 2 or 3 hours a day, it will amortize its cost long before it is worn out. Under these conditions its installation is usually more than justified.

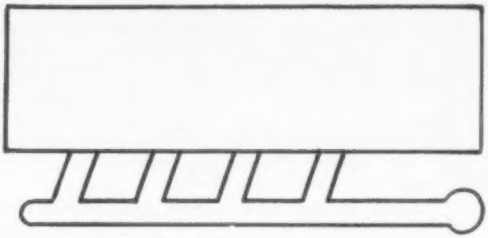


Fig. 1. Ingates placed at angles shown help avoid cutting action of metal, help keep trapped slag out.

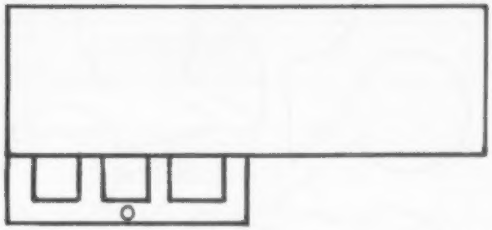


Fig. 2. The poorly designed gating system pictured above might possibly result in a warped casting.

GATING GRAY IRON for PRODUCTION FOUNDRIES

Many gating systems have been developed by trial and error. Some reflect individual preferences and life-long habits while others are dictated by available equipment, the alloys being poured, pouring speeds and temperatures, and the molding sand and molding methods. This article outlines gating methods successfully used by the author for snap flask work and for heavy floor work using edge gates.

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UNIVERSAL RULES for gating do not seem to exist but there are some general principles which many foundrymen follow. Metal, foundrymen agree, should be clean and flow into the mold with minimum turbulence but with sufficient velocity to fill the mold rapidly. The runner should usually be placed in the cope. Extra care should be taken to insure a little harder ramming of the runner and in-gates to eliminate washing.

The sides of in-gates should have a draft of about 30 degrees to insure harder ramming in their vicinity, and all corners should be well rounded to enable the sand to withstand the erosive action of the metal and promote smooth flow. As a general rule, ingates should be at the lowest point of the mold cavity. However, on deep jobs such as rolls, rams, cylinders, etc., some form of step gating should be employed to minimize the fall of metal through the sprue and provide for a supply of fresh metal in the upper portion of the mold cavity as the mold cavity fills.

In-gates function better if not placed at right angles to the runner but at an angle such as is shown in Fig. 1. This helps avoid the cutting action of the first rush of metal and to some degree prevents entrapped slag from entering through the in-gates, favoring its retention in the flow-by of the runner.

The initial velocity of the metal should be reduced by the ingates unless as in cylindrical castings, it can be directed tangentially into the mold cavity where its whirling action can be utilized to cleanse the mold as it fills. With this, a flow-off should be employed to release any accumulation of dross on the surface of the metal. Metal should never be directed at a core if it can be avoided and not unless the core is fortified.

In-gates should be located where they will promote

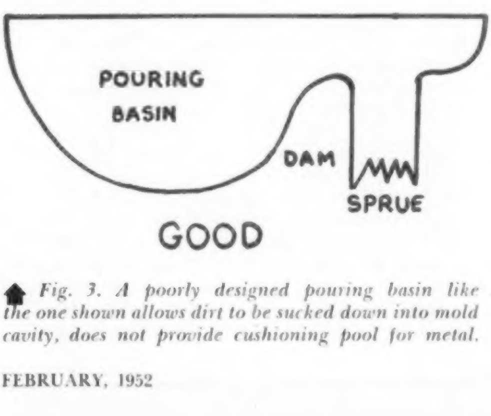
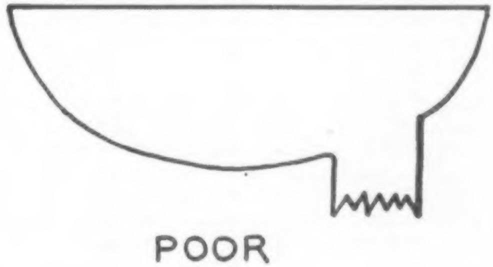


Fig. 3. A poorly designed pouring basin like the one shown allows dirt to be sucked down into mold cavity, does not provide cushioning pool for metal.

Fig. 4. Well-designed pouring basin assures adequate, uninterrupted flow of molten metal to the sprue. Round bottom end of sprue prevents washing.



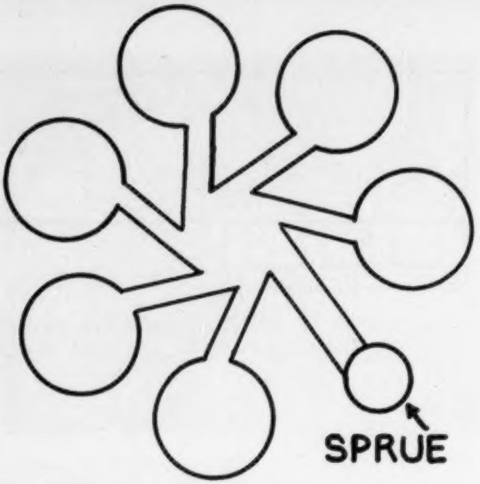


Fig. 5. Circular grouping of patterns gives maximum yield and use of flask space. Metal enters drag in whirling action, keeping sand, slag in center.

progressive solidification. The thin parts of a casting should be fed quickly and not by the slow rise of metal from the heavier sections. Metal should travel the shortest possible distance from pouring basin to mold cavity, with due allowance being made for possible loss through warpage. Figure 2 illustrates poor design in a gating system which might result in a warped casting.

In-gates must be long enough to permit easy separation from the casting but not excessively long so as to waste metal and unduly increase chances of gate erosion.

Pouring basins made as in Fig. 3 allow dirt to be too easily sucked downward into the mold cavity and do not provide for the accumulation of a pool to act as a cushion for subsequent falling metal. A better design is shown in Fig. 4. Size of a pouring basin should be sufficient to assure an adequate supply of molten metal to the sprue without any interruption of flow. The bottom end of the sprue at the junction with the runner should be rounded to prevent washing.

One rule for gate sizes used by some foundrymen calls for the runner to be equal to the combined cross-sectional area of all the in-gates, with the sprue area equal to or slightly larger than the runner area. The author prefers that the area of the runner be 1.2 times the total ingate area and that the smallest cross section of the downsprue be 1.1 times the area of the runner. This particularly applies to multiple gates, (eight or more) as in shallow match-plate production jobs. For general work the author advocates having the sprue, runner, and gate ratio of 6, 6, 1 for single gating, 4, 4, 1 for double gating, 2, 2, 1 for quadruple gating until with eight gates the ratio of 1. 3, 1.2, 1 is reached.

A runner should be slightly higher than its width to

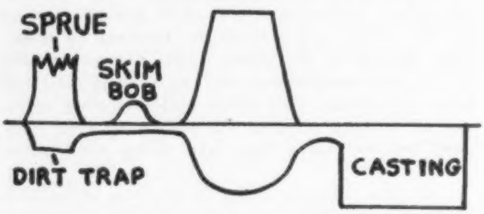


Fig. 6. Upward-sloping ingate bottom permits easy break-off. Dirt-trap area at point of contact with drag bob should be slightly larger than ingate areas.

TABLE 1 -- RECOMMENDED NUMBER OF SYMMETRICAL PATTERNS PER SNAP FLASK

Pattern Diameter, In.	No. Patterns Per Mold	Flask Size, In.	Pattern Diameter, In.	No. Patterns Per Mold	Flask Size, In.
1	32	13 x 13	6-1/4	4	16 x 16
1-1/4	22	13 x 13	6-1/2	2	11 x 18
1-1/2	18	13 x 13	6-3/4	2	11 x 18
1-3/4	14	13 x 13	7	2	12 x 18
2	11	13 x 13	7-1/4	2	12 x 18
2-1/4	11	13 x 13	7-1/2	2	12 x 19
2-1/2	8	13 x 13	7-3/4	2	12 x 19
2-3/4	10	11 x 18	8	2	10 x 21
3	8	12 x 16	8-1/4	2	10 x 21
3-1/4	8	11 x 18	8-1/2	2	10 x 21
3-1/2	8	12 x 19	8-3/4	1	13 x 13
3-3/4	8	12 x 19	9	1	13 x 13
4	6	12 x 16	9-1/4	1	13 x 13
4-1/4	6	12 x 16	9-1/2	1	14 x 14
4-1/2	6	13 x 17	9-3/4	1	14 x 14
4-3/4	4	14 x 14	10	1	14 x 14
5	4	14 x 14	10-1/2	1	15 x 15
5-1/4	4	14 x 14	11	1	15 x 15
5-1/2	4	15 x 15	11-1/2	1	16 x 16
5-3/4	4	16 x 16	12	1	16 x 16
6	4	16 x 16			

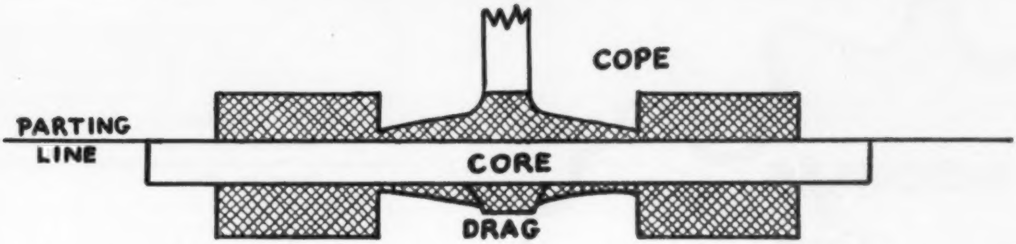


Fig. 7. Adaptation of stack molding to a snap flask increases production and conserves sand and space.

prevent heat from being dissipated too quickly, thereby encouraging cold shuts and misruns. The runner should always extend beyond an in-gate, and never end above one, to insure against dirt entering the gate. The ends of the runner should be well rounded to eliminate sharp corners which may tend to wash. Runners should have a draft of at least ten degrees.

Blind risers must be used with care to insure maximum yield and should extend into the drag as well as into the cope. The cope bob should always be at least twice the height of the drag bob for ordinary gray iron. For higher strength irons with shorter freezing range the cope bob should be three times the height of the drag bob. No bob should ever be less than three inches above the highest point of the casting if its feeding action is to be fully utilized. The drag bob should be

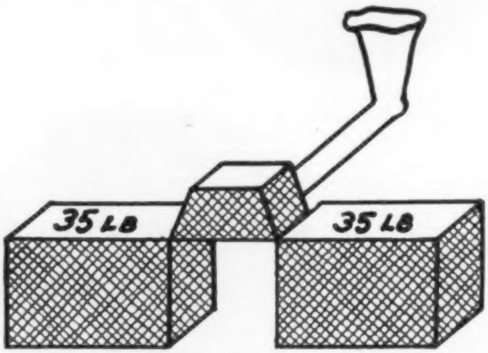


Fig. 8. Example of edge gating directly from runner.

at least one and one-half inches deep or half the height of the cope bob.

The diameter of the riser should be slightly more than the individual casting thickness it is feeding but where it is not possible due to pattern construction or rigging, the drag bob can be deepened and the cope bob height increased to offset this difficulty. The number of castings that a shrink bob should be required to feed should be limited to six. This favors a circular grouping of patterns and permits the foundryman to obtain maximum use of the flask space and maximum yield. Metal should enter in the drag with a whirling action which keeps any slag or sand in the center where it has the least possibility of entering the in-gates. This is shown in Fig. 5.

Actual contact area between in-gate and casting is difficult to specify, but it should be generous to avoid a shrink even at the expense of a little additional grinding. Length of in-gate should not be more than one inch as a rule. Easy break-off is achieved if the bottom of the in-gate slopes upward toward the casting about 15 degrees from horizontal. The sides of the in-gates should have about ten degrees draft with a ¼ in. radius where the gate joins the casting, as illustrated in Fig. 6. The area of the dirt-trap where it meets the drag bob should be slightly larger than the area of any single in-gate.

The locator print for the sprue should be slightly larger than the sprue itself which should be tapered with the smaller end down. The skim bob should be located midway between the locator print and the feed point of the dirt trap.

Table 1 shows the number of symmetrical patterns that can be molded in standard snap flasks. When tight flasks are used, the sand margin may be reduced. As a general rule, in snap flasks, a 1½ in. sand margin at the sides and ends of the flask should be maintained whenever possible to minimize danger of run-outs and facilitate ramming. Space between patterns is generally equal to their depth. As casting thickness increases it is often desirable to increase the space between mold cavities and this is easily done by going to a larger layout.

How to Choose Flasks

To determine the better choice between two flasks for any given layout, divide the number of patterns into the cross-sectional area of the flask at the parting line. The less sand area per casting the shorter will be the molding time.

Special layouts embodying the principles outlined which have proved satisfactory, are shown in several illustrations which also show some additional features. Figure 7 shows an adaptation of stack molding in a snap flask. This technique of using a slab core will double production in flat back castings and conserve space and sand in the mechanized foundry.

Edge gating directly from the runner is illustrated in Fig. 8. In edge gating, the chunky in-gate overlaps the mold cavity by about $\frac{3}{32}$ in. Larger gate thickness usually results in a porous area or well-defined shrinkage cavity adjacent to the overlap. Length of the overlap should be as great as the design of the casting will permit, hence square or rectangular shapes lend themselves to edge gating particularly well. For circular designs, length of the edge gate should be about 15 per cent of the circumference. Edge gating is best employed on bulky castings such as gear blanks, counterweights, etc. Absence of the usual gates and risers materially reduces cleaning time.

NODULES AND NUCLEI in NODULAR IRON

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Work on the metallography and constitution of nodular iron graphite at the Canadian Department of Mines & Technical Surveys points to the existence of central spots or nuclei in the nodules. Sufficient data are not reported, the author believes, to enable major conclusions to be drawn, but this evidence—and work on size and composition of nuclei from magnesium-treated irons to be reported later—may correlate with the work of others to advance the general understanding of the formation of nodular graphite iron.

Probably everyone who has examined a well-prepared sample of nodular iron under a microscope has noticed the small gray-white spots visible in the centers of many nodules. That they are not visible in all nodules is only to be expected if they are located in or near the centers, due to the improbability of bisecting all nodules in a random scattering. These spots

Fig. 4. Photomicrograph of radial type nodule, taken by polarized light and etched in nital. X1500.

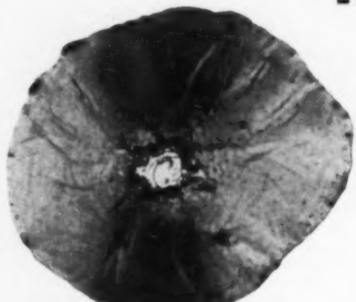


Fig. 1. Nodule and central spot. Etched in nital. X1500

Fig. 2. Nodule and central spot. Polarized light. Etched in nital. X1500

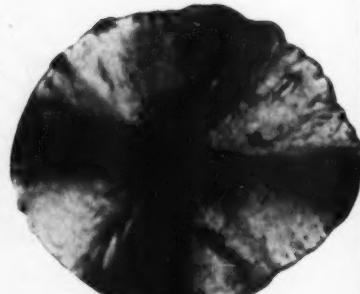


Fig. 3. Radial type nodule. Etched in nital. X1500

are generally called nuclei, and their location and habit lends support to this conception.

A typical example is shown in Fig. 1; Fig. 2 shows the same nodule under polarized light. When the plane of polarization is rotated, the center spot changes in brightness, but it is not certain whether this effect is due to optical effects within the nucleus, or to changes in the relative brightness between nodule and nucleus. The optical cross visible in the graphite in Fig. 2 rotates with the plane of polarization.

The graphite nodule itself has two modes of appearance. One is that displayed in Fig. 1 and 2; the other is evident in Fig. 3 and 4. The radial structure in Fig. 3 is visible probably by virtue of partial polarization of the light by the plane glass mirror, and is intensified by use of polarized light (Fig. 4). When the plane of polarization is rotated on such a nodule, the individual rays light up or darken, without changing position.

Bright spots usually are not visible in the centers of nodules displaying marked radial structure. There is no apparent segregation of types, both radial and non-radial types being found at random and frequently side by side. Duplex nodules are occasionally observed, in which the visible structure of the graphite is different in two parts of the same nodule. This structure is shown in Fig. 5 and 6.

Since the radial structure is invariably on the outside in such cases, it may be that the non-radial structure is graphite which precipitated before or during solidification, and the radial type is graphite precipitated immediately after solidification. Graphite precipitated during annealing of nodular iron is usually of the radial type, as is the spherulitic graphite in white heart malleable iron. The bond between the inner and outer masses of graphite in a duplex nodule is apparently weak, since it occasionally happens (especially during careless polishing) that the inner nodule is cleanly and completely removed, leaving a hollow shell of graphite with a smooth hemispherical interior.

As a general rule, the smaller nodules have the larger central spots. The reason for this is obscure, but it is of practical value to realize that when a nucleus larger than average is sought, the most fruitful field is in the smaller nodules.

Frequently nodules may be found in close association, bunched together. In such cases each nodule has apparently grown from its own nucleus, and mutual interference occurs, as seen in Fig. 8 and 9. Although the central spots are usually too small to enable much detail to be seen with a light microscope, occasionally some structure is visible. Figure 10 shows a nodule containing a nucleus which has evidence of being hexagonal in outline. It has been noted that central spots are not darkened by a hot alkaline picrate etch.

Details Seen Through Electron Microscope

Since the central spots in nodules are of dimensions at about the limit of the powers of the light microscope to observe detail, use of the electron microscope was indicated. After some preliminary work to explore suitable techniques and to become acquainted with the detail visible, a series of samples were polished and etched with different metallographic etching agents, after which replicas were prepared of polystyrene and silica. The nuclei were then examined to see whether any visible attack of the etchant on the exposed nucleus could be detected. Etchants used were:

1. Nital, two per cent.
2. Alkaline sodium picrate, boiling.
3. Picral, five per cent.
4. Stead's reagent (cupric chloride).
5. Ferric chloride.
6. Ammonium chloride.
7. Acetic acid, five per cent.
8. Acetic glycol.
9. Hydrofluoric acid, nitric acid; each two per cent.
10. Phospho-picral etchant.

In no case was any effect on the nuclei detectable, ex-

Fig. 5. Duplex nodule. Etched in nital. X750.

Fig. 6. Duplex nodule. Polarized light. Etched in nital. X750.

Fig. 7. Nodule with attached flake. Etched in nital. X1200.

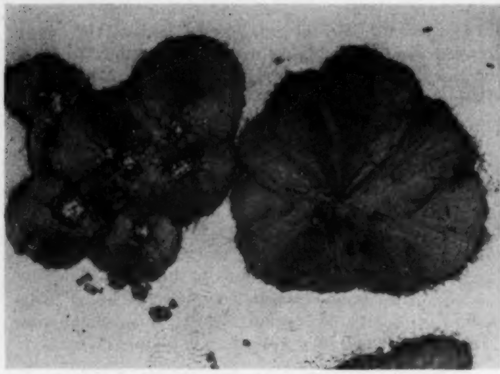


Fig. 8. Clustered nodules. Etched in nital. X1500.

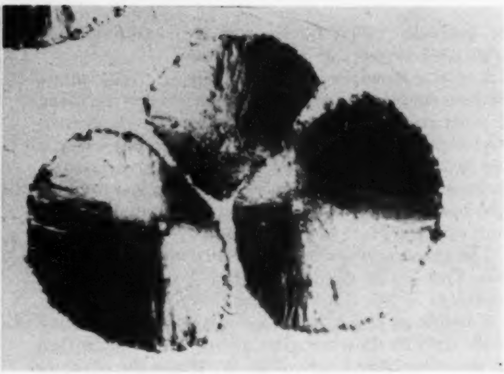


Fig. 9. Clustered nodules by polarized light. X1500.

cept for the occasional appearance of minute etch pits. The nuclear material is apparently inert to all of the above reagents in the concentrations used.

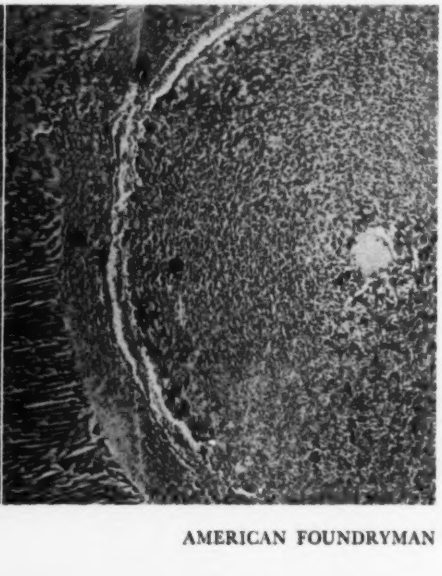
Under the electron microscope, the structure and detail of both the graphite nodule and of the central area were very different from that noted with a light microscope. This is believed to be due both to the complete lack of polarization effects and to the very much higher resolution obtainable.

In general, differences between radial and nonradial structure were still evident, as shown in Fig. 11 and 12. The onion-skin effect of Fig. 12 was fairly common.

One surprising observation was that of occasional nodules in which the whole nodule had crystallized in a hexagonal pattern with flat sides. In no case had this been detected under the light microscope. The reason for this difference in observation is not known. Figure 13 shows this type of nodule; the photograph is made up from two adjacent negatives from the electron microscope, mounted and rephotographed to reduce the

Fig. 10. Photomicrograph of nodule containing an apparently hexagonal nucleus. Etched in nital. X1500.

Fig. 11. (below, left). Radial structure lines in graphite. Etched in nital. X3000. Fig. 12. (below, right). Concentric structure of graphite. Etched in nital. X3000. Onion-skin effect is fairly common.



scale of magnification. It is interesting to note also the details of internal graphite structure, and of surrounding pearlite, brought out by the electron microscope but not visible under a light microscope at the same final magnification.

On one occasion a distinct hexagonal structure was noted at the center of a nodule as shown in Fig. 14. It was thought that this was due to a part of the nucleus being transferred to the final replica.

Central Spot Indicates Imperfections

In general the central spot is heavily marked, indicating that the surface has been chipped or that imperfections exist. A typical structure is shown in Fig. 15. Nuclei of the structures shown in Fig. 16, where a broad band crosses the nucleus, were occasionally noted.

In Fig. 17 and 18 are shown two views of the same nucleus at different magnifications. In Fig. 18 considerable detail is visible. It has been noted in several instances that if the interface between graphite and nuclear material is outlined with straight lines, the angles of intersection are compatible with the concept of a hexagonal crystal structure.

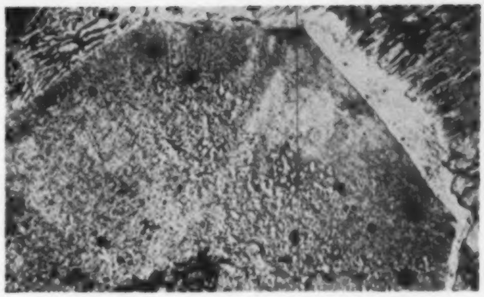


Fig. 13. Prismatic nodule. Etched in nital. X2500.

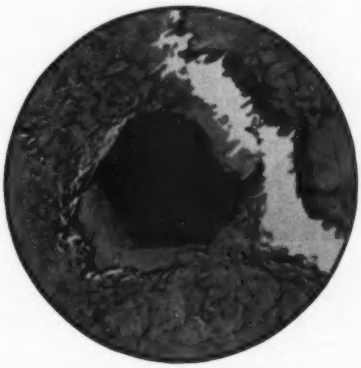


Fig. 14. The nucleus dislodges. $FeCl_3$ etch. X9000.

A characteristic structure is visible in the graphite, apparently brought about by the process of metallographic polishing. In Fig. 19 is shown a structure considered to be significant in suggesting the mode of crystallization of the graphite. The small Y-shaped structureless piece may be the nucleus proper, or rather the top of a nucleus. The graphite apparently has crystallized radially in a slightly folded fan arrangement.

Tentative Conclusions

Some tentative conclusions have been drawn as a result of extended electron microscope study of the graphite nodules in nodular iron.

1. There is a central spot present in many nodules, which is not graphite and which has properties much different from the surrounding graphite.

2. Nucleus is possibly associated with each nodule.

Fig. 15. Nucleus is shown etched in $FeCl_3$. X15000.

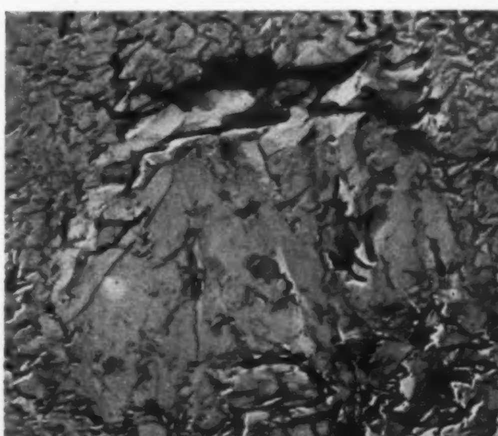


Fig. 16. Nucleus is shown etched in nital. X7600.

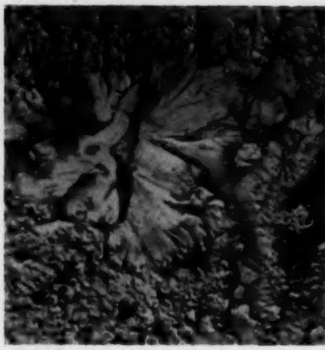


Fig. 17. Nodule and nucleus etched in nital. X3000.

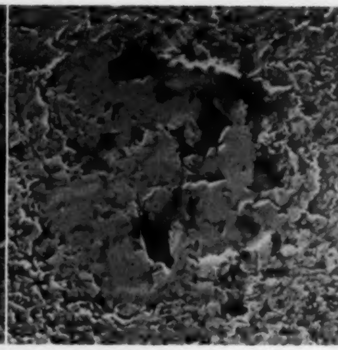


Fig. 18. Nucleus. Etched in nital. Shown at X16,000.

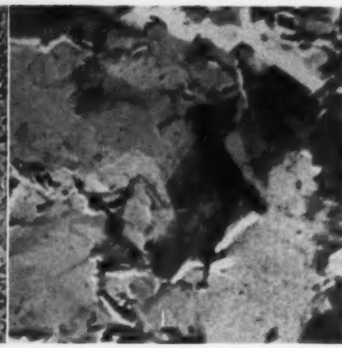


Fig. 19. Nucleus and graphite structure. HNO_3 etch. X9000.

3. The nuclear material is very hard, and has a strong tendency to chip or flake.

4. The nucleus usually has a somewhat distorted regular polygonal form. Elongated or rectangular nuclei are very rarely observed.

5. The nucleus is possibly of hexagonal habit.

6. The nuclear is apparently unaffected by a wide range of dilute acids, except for the occasional formation of minute etch pits, and is relatively inert chemically, or corrosion-resistant.

7. The graphite of which the nodule is composed is not a single crystal, but is rather a growth of many crystals crystallographically arranged.

8. Formation of spherulitic graphite nodules in nodular iron is possible caused by precipitation on a kindred nucleus.

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1952 APPRENTICE CONTEST CLOSES MARCH 15

AMERICA'S TOP APPRENTICE patternmakers and molders again this year will compete for cash awards and a trip to the 1952 International Foundry Congress in Atlantic City, May 1 through 7, in the 1952 A.F.S. Apprentice Contest.

The Contest closes March 15 and National Judging will be held at the University of Illinois, Navy Pier Branch, Chicago, on or about April 1. Winning Chapter and plant contest entries must be shipped to Prof. R. W. Schroeder, Department of Mechanical Engineering, Room 72, University of Illinois, Navy Pier Branch, Chicago, so as to arrive by March 29.

During the Convention's Annual Business Meeting, A.F.S. National President Walter L. Seelbach will award certificates and $100 to first prize winners in each of the five contest divisions—Gray Iron Molding, Steel Molding, Non-Ferrous Molding, Wood Patternmaking and Metal Patternmaking. These winners will also have their round trip rail and Pullman fare paid to and from the Convention. Second prizes of $50 each and third prizes of $25 each will be awarded runners-up in each Division in appropriate A.F.S. chapter or plant ceremonies.

Now in its 29th year, the contest is open to all apprentices in the United States, Canada, and Mexico who are taking a regular course of training of not less than three years' duration. Contestants may not be over 24 years old on the day they prepare their entries; veterans' age limit is 24 plus length of service in the Armed Forces.

Again this year, judges will observe a regulation which states that in each division "Entries must be salable castings and patterns, and to qualify the first prize winner must rate a score of 88 points minimum, second prize winner 85 points minimum, and third prize winner 76 points minimum."

Complete information on the contest can be obtained by writing to Jos. E. Foster, Technical Assistant, American Foundrymen's Society, 616 S. Michigan, Chicago 5, Ill. In addition to regulations, A.F.S. Headquarters supplies patterns for the molding divisions, blueprints for wood patternmaking, and rough aluminum castings and blueprints for metal patternmaking.

Those chapters and plants who are now in possession of contest molding patterns are requested to return them to Mr. Foster at A.F.S. Headquarters as soon as they have finished with them, since these patterns are needed by other contestants.

Apprentices may enter the 29th A.F.S. Apprentice Contest as individuals or through a plant or chapter contest. In addition to a number of individual entries, the National Judging will include winners of several A.F.S. Chapter and local plant contests.

Companies and individuals who have contributed time and materials to the 1952 Contest include: Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit (rough castings); Otto Harer, Scientific Cast Products Co., Chicago (20 aluminum patterns for molding divisions); George E. Garvey, City Pattern & Foundry Co., South Bend, Ind. (finishing of aluminum patterns); Robert Selburg, Caterpillar Tractor Co., Peoria, Ill. (master pattern from which duplicate metal molding patterns were made); and International Harvester Co., Chicago (shipping boxes).

SYNTHETIC RESIN COREBINDERS

A Report of the Institute of British Foundrymen

This report of the Institute of British Foundrymen's Sub-Committee T.S. 30 covers the technical, economic and health aspects of the use of synthetic resins in the foundry industry. To obtain the information given in this article, the Sub-Committee circulated a questionnaire to all British foundries believed to have knowledge of the subject. Data from answers, plus information from the British Plastics Federation and practical experience of members of the Sub-Committee have been incorporated into the report. Sub-Committee T.S. 30 is made up of Chairman G. L. Harbach, B. Abbott, J. M. J. Estevez, E. L. Graham, H. Greatorex, J. Hill, A. R. Martin, G. W. Nicholls, W. B. Parkes, P. G. Pentz, S. A. Perry, L. W. Sanders, A. Tipper and G. Lambert, secretary.

SEVERAL CLASSES of synthetic resins have been proproposed and tested as core binders; phenolic (phenol- or cresol-formaldehyde, known generally as P.F.) resins; urea (urea-formaldehyde or U.F.) resins; melamine (melamine-formaldehyde or M.F.) resins; resorcinol resins; polyester resins; methyl cellulose, and others of less importance. Of these, only the P.F. and U.F. resins have been used in practice on a large scale; though melamine resins have found some use, particularly in Switzerland, in spite of their much higher cost, and methyl cellulose has been employed on the Continent with some success in light-alloy foundries, where low dry strength is not a serious disadvantage. It appears unlikely that the plastics industry will be able to provide, in the predictable future, any new classes of synthetic resin possessing the valuable core-bonding properties and moderate cost of the U.F. and P.F. resins, and attention is, therefore, concentrated on these two major classes.

Urea-Formaldehyde Resins

U.F. resins are available both as liquids and in solid form as dry powders, which may consist entirely of resin, or may contain controlled proportions of cereal or other ingredients to provide green strength. The liquid resins tend to be somewhat cheaper (on a basis of equal resin-solids content) and are more widely used. They usually contain 50 to 70 per cent resin solids, the balance being mainly water. Bonding strength is roughly proportional to the resin-solids content, but other factors may have a substantial influence, and cost comparisons should be made only on the basis of total binder costs for a given quantity of mixed core sand.

Many grades of U.F. resin are available, and the properties of importance in foundry work may vary substantially between one grade and another. Uniform and constant quality can, however, be expected in any one grade.

Properties Common to All U. F. Binders

Among the liquid U.F. resins, differences may be found in resin content, viscosity, stability during storage, excess formaldehyde odor (apparent during sand mixing), and effect on green strength. Important properties common to all U.F. resin binders are:

(1) In use they are permanently changed by heat alone, or by the use of chemical catalysts, into hard infusible solids, practically unaffected by moisture. This change does not require the presence of air, and is largely independent of sand permeability or of air circulation in baking ovens.

(2) The baking time required to effect this "curing" or hardening of the resin is much shorter than for linseed or similar core oils—usually about half as long. Curing of the resin may be effected at temperatures ranging from room temperature to about 170 C. Above this temperature, the resin will begin to decompose. It should be noted, however, that this refers strictly to the temperature of the core itself and higher stove temperatures are used in practice (see section on baking).

Reduction in baking time appears to be one of the most important advantages offered by U.F. resin binders for general foundry work.

(3) U.F. resins are especially suitable where high-frequency heating can be used for baking the cores, since they can be cured extremely rapidly, with minimum power consumption, and without possibility of overbaking. Provision should be made, in designing the high-frequency oven, for ventilation to remove the water vapor and lachrymatory formaldehyde gas evolved by the resin during the curing process.

(4) The U.F. resins normally contain "free" or excess formaldehyde; those manufactured specifically for use as core binders are usually so made as to reduce this to the lowest practical level, thus effectively preventing the development of unpleasant formaldehyde fumes during the mixing of the core sand. If the sand is hot, however, or its temperature is raised sufficiently by friction in the mixer, formaldehyde may be generated to a noticeable and inconvenient, though not dangerous, extent. During baking of the cores it is inevitable that relatively large quantities of this gas will be evolved, but these would normally

be carried away with other oven gases in the oven ventilation system. Completely baked cores in which the resin has been fully cured, have no detectable odor of formaldehyde.

(5) All U.F. resins break down rapidly at casting temperatures, even at the relatively low temperatures reached by cores in light-alloy castings. This characteristic leads to two outstanding advantages of this type of binder, and to one necessary limitation on its use—excellent knockout properties, and freedom from hot tears or cracks in light-alloy or malleable-iron castings in thin sections, even when cores have high dry strength; but some danger of premature core collapse when used in heavy steel or iron castings. Where rapid breakdown of binder is of major importance, U.F. resins are undoubtedly far superior to linseed and similar core oils, and to P.F. resins.

Odors Not Considered Harmful

(6) All U.F. resins, under conditions which cause partial decomposition by heat, but not complete combustion, produce odors which are generally regarded as rather unpleasant, but which do not appear to be associated with any harmful effects on health. Such conditions exist in core ovens if baking is excessive, and overbaked cores can be recognized by their characteristic "burnt-fish" smell. Since such overbaked cores have reduced strength and surface hardness, this would point to the need for better control of baking conditions. The odor problem is, therefore, confined in practice to the "smoking-off" period after casting, and to the knockout operation. It is emphasized that this type of odor is characteristic of all U.F. resins. Remedial measures consist chiefly in the use of the lowest proportion of U. F. resin in the core sand to give the necessary strength, the hollowing out or filling with coke, etc., of the interiors of large cores, and special ventilation at smoking-off and knockout stations.

Some reduction in the amount of smoke after casting is observable when oil compounds are replaced by U.F. resins

(7) Gas evolution from U.F. reins during casting differs from that experienced with linseed-oil preparations, mainly in the rate rather than in the quantity evolved. In the initial stages of its decomposition a core bonded with resin evolves gas at a considerably higher rate than an oil-bonded core. This does not seem in practice to cause any difficulty, though in certain cases extra venting may be desirable.

Stability Varies in Storage

(8) Stability of U.F. resins during storage varies quite widely. Powdered resins, if kept dry and reasonably cool, will remain practically unchanged for a year or more. Liquid U.F. resins usually thicken slowly during storage, but remain suitable for use over periods ranging from 1 to 9 months or more, depending on the particular grade of resin, provided they are stored in a cool place (preferably below 70 F). Resin suppliers can specify the storage life to be expected from each of their individual products.

(9) The effect of moisture in the mixed core sand on the dry strength and surface hardness produced by U.F. resin binders is very pronounced; both these properties in the baked core improve greatly as moisture content is raised. They usually attain maximum values at a moisture content of 4 to 6 per cent. This is probably the result both of improved distribution of the resin during mixing, and of some migration of resin from the center of the core, providing extra strength and hardness at the surface. In practice, it may be impossible to use so high a moisture content, because increase in moisture above a certain level (which varies with the nature of the sand, and the amounts of cereal, clay—if any—and resin mix) causes a severe increase in the tendency of the sand to stick to coreboxes, etc. To some extent, this can be overcome by the addition of lubricants, parting compounds, etc., and/or by suitable treatment of coreboxes. Substantial economies in resin consumption can be effected by working at the highest practical moisture content in the green core sand.

(10) It follows that where, as is usual, a cereal binder is used to provide green strength and plasticity, the type of cereal chosen should be such as to tolerate as high a moisture content as possible. For this reason, cereals like pre-gelatinized starch, flour, etc., are generally preferred to dextrin for use with resin binders.

Some synergistic action appears to take place between the resin and the cereal, whereby a combination of the two gives greater strength to the baked cores than would be expected from the performance of either alone.

(11) The U.F. resins, and the raw materials from which they are made, are entirely of British manufacture. Ample supplies are available.

Phenol-Formaldehyde Resins

Phenol-formaldehyde resins are available, like U.F. resins, both as dry powders and as liquids usually containing 50 to 70 per cent solids. The P.F. resins may be made from phenol or from its various homologues, and a large number of different types and grades may be supplied for foundry work. Comparisons should be based on performance in relation to total binder costs.

The various grades of P.F. resin can be expected to differ in resin content, viscosity, stability during storage, "free" formaldehyde and effect on core strength properties. Properties common to all P.F. resin binders are:

(1) They are thermosetting (see paragraph (1) U.F. resins). After curing they are even less affected by moisture than U.F. resins.

(2) Baking time required to effect curing of the resin is about the same as for U.F. resins, but a slightly higher temperature is usually desirable. A difference of major importance is that P.F. resins are very much less sensitive to baking conditions than U.F. resins. In fact, their resistance to overbaking is approximately equal to that of linseed oil. While it is usually possible, therefore, to bake P.F. resin-bonded cores under the same conditions as oil-bonded cores, the oven temperature can often be reduced with advantage, and the baking time can usually be halved.

Certain types of P.F. resin may be cured at room temperature through the use of suitable acid catalysts, but they are not usually recommended for core-binding. It is normally necessary, therefore, to raise the temperature of the resin in the core to about 150 to 175 C in order to effect the hardening of the resin in a reasonably short time. Above 175 C the resin will begin to break down, though more slowly than a U.F. resin. Optimum oven temperature is usually about 430 F (220 C). As with U.F. resins, the saving in baking time and fuel is one of the chief advantages offered by P.F. resin binders.

(3) The P.F. resins react well to high-frequency heating and, like U.F. resins, may be cured extremely rapidly by this means. The power required is, however, usually rather higher than for U.F. resins.

(4) The P.F. resins normally contain some excess formaldehyde which may be noticeable during the mixing operation if the sand is, or becomes, hot (see paragraph (4) U.F. resins). Formaldehyde is necessarily evolved during baking, but this should present no difficulty in practice, given normal oven ventilation. Completely baked cores have no detectable odor of formaldehyde.

(5) The P.F. resins usually break down after casting at about the same rate as oil binders; therefore, when used in cores for light-alloy, for thin iron or malleable castings, cores should not be made too strong. (Note difference from U.F. resins, paragraph 5).

(6) The odors produced by P.F. resins after casting are generally agreed to be less in quantity, and less obnoxious, than those from other types of binders, including oils. The amount of smoke produced is also less than from core oils. These constitute a definite advantage for P.F. resins as core binders.

(7) Both the amount and the rate of gas evolution from P.F. resins are lower than from either U.F. resins or linseed oil. Where low gas content is advantageous, P.F. resins may offer distinct advantages over other types of binder.

(8) The stability of P.F. resins during storage is much the same as that of U.F. resins (see U.F. paragraph 8).

(9) The importance of moisture content in the mixed sand is the same for P.F. as for U.F. resins (see U.F. paragraph 9).

(10) The need for choosing a suitable type of cereal for use with P.F. resins is exactly the same as for U.F. resins (see U.F. paragraph 10).

Like U.F., P.F. resins with cereal binders impart strength properties which are more than additive.

(11) P.F. resins, and all the raw materials from which they

are made, are entirely of British manufacture. Large production facilities exist, and no difficulty is anticipated by the resin manufacturers in supplying the needs of the foundry industry.

While it seems unlikely that other classes of synthetic resin will be important as core binders, it may well be that modifications of U.F. and P.F. resins, possibly by blending with other bonding agents, may be effected with benefit to coremaking properties.

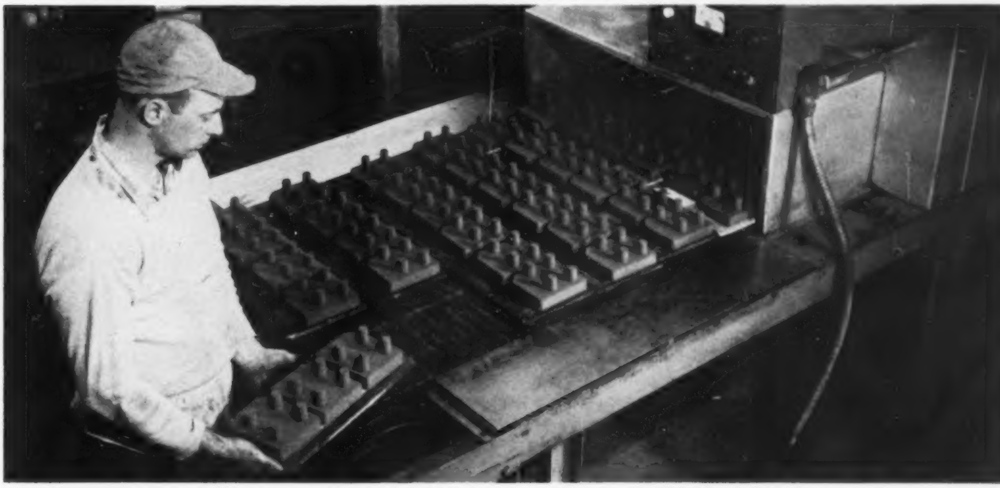
Of the 40 replies to the questionnaire, 30 foundries reported experience of either or both U.F. and P.F. resins as core binders, U.F. resin being the most commonly used. Six foundries, following successful trials, were seriously considering their use on a production scale, and a further six had already adopted them as standard practice. Satisfactory results were reported for widely varying weights and sections in cast iron, steel, malleable iron, copper-base alloys and light metals.

The following summarizes the information obtained from the replies to the questionnaire, the report from the representatives of the British Plastics Federation, and practical experience of committee members.

Mixtures:—Silica sands are normally used with, in some cases, clay additions either as naturally bonded sand—up to about 20 per cent—or as bentonite or other colloidal clays up to about 0.5 per cent. The advantages of adding clay are that it reduces or prevents stickiness in mixtures of high water content, increases green strength to prevent sagging and retards collapse when pouring heavy-section castings. Clay additions have the usual disadvantages of reducing dry strength and increasing friability; if an addition of red sand is made in order to introduce clay, there is also a reduction in permeability.

The general range of liquid resin content is 0.5 to 3 per cent, with a cereal binder of the starch type from 1 to 2 per cent, the higher proportions of resin or cereal being necessary when substantial amounts of clay are present. Moisture varies from 1 to 5 per cent, increasing with the clay and cereal contents. To reduce stickiness and improve flowability, paraffin or other liquid parting agent from ¼ to ½ per cent is frequently added. Various chemical catalysts or other special ingredients, such as hexamine, boric acid or certain acid salts may also be added (in consultation with the supplier of the resin) to achieve particular effects.

Mixing practice generally follows that for oil sand. The dry constituents may be added to the sand, followed by the liquids, but in certain cases it may be advisable to add the water and resin before the cereal powder. It may sometimes be necessary to mix a somewhat smaller batch than for oil-sand practice. Mixing time varies but is usually from 3 to 6 min.



Resin cores being baked in a high-frequency induction furnace.

The presence of lachrymatory fumes during mixing is accentuated by the use of hot sand, but the degree appears to depend partly on the type of resin used and partly on the temperature attained during mixing.

Bench Life—Airdrying Properties and Core-making: In some cases bench life is stated to be poor, but one large user on full production has claimed that bench life is better than with oil sand. In general, there appears to be little difference. The deciding factors are the mixture used (particularly the presence or absence of catalysts capable of curing the resin at shop temperature), and moisture content of mixed sand.

In certain mixtures of resin-bonded sand, especially those of high permeability, air drying is more rapid than for oil sand. This may cause considerable difficulty, particularly with small cores, because it leads to lower dry strength and friability of the baked cores, unless prevented by spraying or other treatment before baking.

As regards sticking of sand to rammers, core boxes and strickling tools, it has been noted that under conditions of high atmospheric humidity the mixed resin sand may become sticky. However, this can be prevented by suitably adjusting the moisture content and

possibly by increasing the proportion of parting medium in the sand mixture. Coremakers should not wipe coreboxes with linseed oil as a parting medium.

Core blowing with resin-bonded sands is possible, though some modification to increase flowability is advisable, such as reducing moisture and clay contents and the addition of fuel oil or other lubricant.

If blacking is practised, cores can be sprayed green and are ready for immediate use after baking. This also helps to protect the surface against the effects of overbaking. If blacking is not normally used, then cores may be sprayed with water or a 10 per cent resin solution, to provide an extremely hard skin. A similar resin solution may be used in blacking mixtures in preference to an oil addition. Resin cores may be jointed by the usual accepted methods, i.e., pasting or lead jointing.

Baking: When not baked alongside oil-bonded cores, reduced baking time and temperatures appear to be general practice. Oven temperatures between 150 and 250 C (300 and 480 F, approximately) are commonly used, but with U.F. resins at temperatures above 175 C (350 F) serious loss in core strength may occur unless the baking time is adjusted and closely controlled in relation both to the oven temperature and to the dimensions of the cores baked. Oven temperatures much above 175 C are in practice unsuitable for U.F. resins unless all the cores in each oven charge are of about the same size, and are roughly uniform in sectional thickness; otherwise, smaller cores or thin sections will be seriously overbaked before thicker portions are adequately cured. For small cores a baking temperature of 150 C does not lengthen appreciably the baking time required. Oven costs may be reduced through savings in fuel and oven maintenance. Similar considerations apply to P.F. resins, though, as noted earlier under P.F. resins, these are much less susceptible to overbaking than U.F. resins. Because of the adverse effect of air-drying on dry strength, as mentioned previously, better results are obtained by introducing cores into a hot oven than by heating slowly from cold.

Efficient oven ventilation should be provided to remove the lachrymatory fumes of formaldehyde emitted during baking.

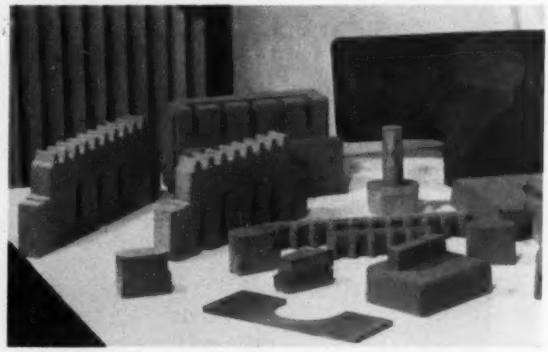
Dimensional Accuracy: In general, the dimensional accuracy obtained when using resin cores is claimed to equal that obtained when using oil-bonded cores, but two users, working to close limits, find evidence of slight contraction as certain cores show a small amount of sag, although no bulge appears at the base; in contrast, a slight expansion has been experienced by another user. It may be necessary in certain cases to alter equipment to suit the physical properties of the sand.

Core Storage: Resin-bonded cores do not deteriorate more than oil-sand cores during storage. Damage during handling may result in certain cases due to a tendency to brittleness. Experience indicates that no serious damping back occurs in green-sand molds.

Casting Fumes:—Practically all users of U.F. resins complain of a fishy odor when casting and at the knockout, some claiming the fumes to be more disagreeable than those from oil-sand cores, others stating that, once acclimatized, they suffer no discomfort from the fumes and find them preferable to oil-sand fumes. Users of P.F. resin find much less fumes than with oil-sand and no objectionable odor.

Knockout: Agreement is unanimous that U.F. cores give excellent knockout properties—cores collapse completely even in castings of thin sections. P.F. resin cores are reported as equal to, or better than, oil-sand cores but not equal to U.F. resin in this respect.

Casting Finish: No definite conclusion can be drawn on this point, but there is general agreement that the casting finish obtained when using resin cores is not inferior to that obtained when using oil-bonded cores—much appears to depend on the core mixtures, the metal used and the casting temperature.



Typical examples of the wide variety of

Ferrous Foundry Applications

Cast Iron—General: Both U.F. and P.F. resins have been used for bonding cores for iron castings. Because of their lower and less rapid gas evolution, phenolic resins can be used with advantage on castings where the core is almost completely surrounded by metal.

Precautions: Experience with resins for cast iron (which may also apply equally to other metals) has shown that several practices, which are widely used by coremakers and coresetters when using oil sand, should be avoided with resin-bonded cores, e.g.:

(a) Rubbing core surfaces for the purpose of removing the hard skin, the latter being said to prevent the metal flowing evenly over the core.

(b) Re-blacking cores which have been rubbed. This tends to cause slight scabbing, due either to the blacking peeling under the flow of metal or the resin being burnt by excessive torch drying.

In any case, the rubbing of resin-bonded cores is undesirable, as the exposed surface tends to be friable.

Steel: On the basis of a statement received from the British Steel Founders' Association, a few steelfounders have made spasmodic or preliminary trials of synthetic-resin binders, but they are not generally used.

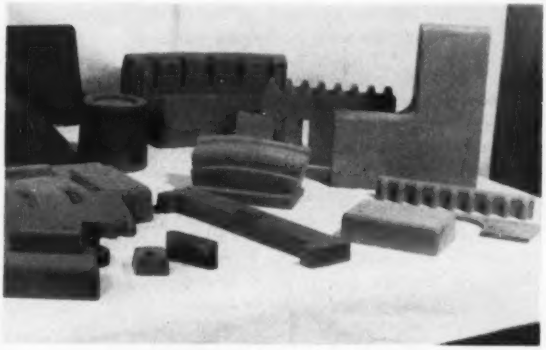
Non-Ferrous Foundry Applications

Copper-base Alloys: Little information is available on the use of resin-bonded cores in the production of bronze and brass castings, but it is known that both U.F. and P.F. resins have been used successfully. No

difficulties peculiar to these metals have been reported and, in fact, so far as resistance to metal penetration and finning are concerned, U.F. resins hold promise of providing special advantages. The possibilities of P.F. resins have not yet been fully explored in the case of non-ferrous foundries, but should be of interest both from the fume aspect and because of the slower rate of gas evolution.

The advantage of fast curing of resin bonds in sand masses of low permeability (i.e., fine silica or clay-bonded sands) is likely to be specially useful in non-ferrous sand practice where metal penetration must be prevented and a good surface finish is important.

Light Alloys: For light-alloy castings attention has so far been concentrated on use of U.F. resins, because of early breakdown and good knockout properties.



cores obtainable with resin corebinders.

Up to the present, resin-bonded cores have not found widespread use in the light-alloy industry, due partly to difficulties characteristic of resin binders which have been dealt with under general foundry applications, and also because of the greater amount of fume after casting (due to the lower casting temperature) and to the economic aspect. Since the dry strength generally needed in cores for light alloys is less than in cores for ferrous castings, there is frequently less economic advantage in using resins. There may be other considerations such as less friable core surface, less breakage in handling, faster baking and easier knockout.

Economic Aspect

Binder costs in present foundry practice vary so greatly that a general comparison between resins and oils or other commonly used binders cannot be made. It can be said, however, that U.F. resins can frequently be used to provide the required properties at an equal or lower cost. This is less often true of P.F. resins because their price, due to raw material costs, is necessarily higher. There are other advantages in the use of resin binders which have economic significance, e.g., increased output from core ovens and economies in fuel. Further possible economies are the elimination of redrying of blacked cores and a possible reduction in cleaning room costs.

From the national viewpoint, synthetic resins are home-produced from indigenous materials, whereas linseed oil is obtained largely from hard-currency areas.

Comfort and Health

The question of fumes from U.F. and P.F. resins has been dealt with in this report under "Properties of Synthetic Resins (U.F. paragraphs 4 and 6, and P.F. paragraphs 4 and 6)" and also under the section on "Foundry Applications—Casting Fumes." It should be noted that P.F. resins are better in this respect than either U.F. resins or oil binders, although, due to the presence of cereal binder in the mixture, it cannot be claimed that even P.F. resin cores are entirely free from fumes after casting. From the Committee's discussions with the Factory Department of the Ministry of Labor and National Service, there appears to be little evidence that fumes from synthetic resins present risks to health. It was emphasized, however, that the composition of the fumes is not accurately known. The Factory Department would welcome any information resulting from future foundry experience of these or other materials and complaints of ill-health, however apparently trivial, should be brought to their notice.

Good Ventilation Is Essential

Good ventilation to remove fumes during baking and casting, to which attention is called in the Joint Standing Committee on Conditions in Iron Foundries' technical report, entitled "Practical Methods of Reducing the Amount of Fumes from Oil-bonded Cores," is equally desirable in the case of synthetic resin bonded cores.

Investigate Possibilities of Dermatitis

As an assessment of the risk of dermatitis to users of synthetic resins in foundries was considered to be of importance, the Committee deemed it their duty to investigate the matter as fully as possible.

In the course of exhaustive inquiries they have drawn on the experience of foundry users in this country and in the United States, on that of resin manufacturers in handling resins, and also on the knowledge and views of the Factory Department of the Ministry of Labor.

It has been established that some operatives contract dermatitis which may be associated with the use of synthetic resins as core binders. In such cases it is advisable to withdraw such workers, whose sensitivity will be apparent during the first few weeks of exposure, and employ them on alternative duties.

As in the case of other industries using synthetic resins, appropriate information should be provided for operatives on the measures necessary to minimize the risk of dermatitis, of which one of the most important is washing. The Committee is pleased to report that the Factory Department of the Ministry of Labor and representatives of the resin manufacturers have agreed to collaborate in submitting suitable advice to the foundry industry.

It is considered opinion of the Committee, after a very careful examination of the facts as at present known, that while the risk of dermatitis is not negligible, it is a hazard that calls for no restriction in the use of synthetic resins in the foundry industry. However, in view of the paucity of the available data, the Committee wishes to stress to users the importance of establishing a check of complaints, what-

ever their nature, alleged to be due to a change in core binders, so that more definite conclusions, based on the accumulated information, can be formed at a later date.

Summary

Information supplied from various sources showed that considerable interest had been displayed in the use of urea and phenolic resins as core binders. The result of much experimental work was revealed and a few—generally large—foundries reported satisfactory use on a production scale.

Various criticisms were made due to the different characteristics of synthetic resins as compared with oil-bonded sand and, in a number of cases, experiments had been dropped in consequence. In cases where the right type of resin was used and the necessary modifications in practice were made, results were claimed to be equal to those given by oil-bonded cores and at lower cost.

The principal criticisms were of the sticky nature of the mixed sand and lack of flowability; nevertheless, by the addition of paraffin or other parting compounds, this defect could be offset, so much so that resin-bonded sands were in satisfactory use on core-blowing machines.

Both moisture content and milling time are somewhat critical in producing the required green properties, but, given a suitable mixture of resin, cereal—and possibly clay—and adequate technical control, the resin-bonded sand could be made to be practically indistinguishable from oil-bonded sand as regards "feel," bench life and working properties.

Baked strength depends a great deal on the moisture content present when baking; therefore, if cores are allowed to surface dry before baking, weak, friable cores result, but blacking or spraying of green cores just before baking improves the strength and hardness of the core surface. However, a fairly general complaint, from large users, of brittleness, with consequent loss of cores due to chipped edges or increased fettling costs, suggests that excessive hardness is undesirable, and the ideal resin has yet to be found. Baking at 150 to 175 C for U.F. and at 200 to 250 C for P.F. is usual and, as no time for oxidation is required, normal baking times can be halved.

Damping back presents no serious problem if adequate proportions of resin are used, when the baked cores have good moisture resistance under normal foundry conditions.

Dimensional accuracy is usually satisfactory, although the results may depend in some degree on the mixture used and the precautions taken against sagging, particularly with medium to large cores.

Rubbing of cores is not recommended, as the exposed surface tends to be friable.

P.F. resin cores have a lower gas content than those bonded with oil; U.F. resin cores yield a quantity of gas similar to oil-bonded cores, but at a high initial rate which may necessitate additional vents.

Ease of knockout and fettling is a characteristic feature of U.F. resin cores, due to their complete disintegration and the reduced tendency to finning; P.F. resin cores in these respects are not noticeably different from oil-bonded cores.

Casting finish obtained when using resin-bonded cores is not inferior to that obtained when using oil-bonded cores under similar pouring conditions.

Synthetic resins are home produced; they are also in ample supply; the cost of mixed sand is generally about the same as that of comparable oil-bonded sand; savings accrue due to reduction in baking costs and, in the case of U.F. resins, fettling costs may be reduced.

During casting, neither U.F. nor P.F. resins evolve the irritant fumes associated with oil-bonded cores, but the fumes from U.F. resin are disagreeable. The question of harmful fumes and the incidence of dermatitis is not negligible, but information available indicates that there is no reason to restrict the use of synthetic resins in foundries, as in the experience of users the number of cases of dermatitis appears to be no greater than with oil-bonded sands.

Conclusion

The interest, amongst founders, in synthetic resins for core binding has now reached the stage where several foundries can show that advantages are real. On the other hand, some foundries have rejected synthetic resins on the score of odor and/or production difficulties.

Methods that are accepted for oil sand must not necessarily be carried on with a changeover to resin sand, and the new binder must be treated with respect and methods adapted to its characteristics.

The Sub-committee is of the opinion that P.F. resin approaches the ideal of a practical and fumeless core binder. Nevertheless, the economic attractions of U.F. resin and the fact that fumes from the cereal portion of the mixture are inevitable, whichever resin is used, emphasize that good ventilation, together with the use of a minimum percentage of binder and thoroughly baked cores, is the most practical means of improving conditions in foundries.

NPA Issues "Scrap for Defense" Book

Now being distributed to more than 200,000 executives of business, industry and trade associations is the National Production Authority's 16-page booklet, *"Scrap for Steel Mills and Foundries for Defense."* The booklet outlines a three-point program for the recovery of dormant scrap that applies to all industries, large and small:

(1) Go after dormant scrap. Start an emergency inspection and inventory of all heavy steel—whether machines, equipment, beams or plates. Dispose of all possible steel to a scrap dealer.

(2) Appoint someone with authority to clean out dormant scrap and to be responsible for a continuous good housekeeping job.

(3) Form a salvage committee that will have authority to make decisions and that will (a) search all plants and properties, regardless of size, for such dormant scrap as obsolete machinery and broken, dismantled and outworn equipment: (b) survey potential wrecking and dismantling projects that will produce scrap, and (c) make disposition of all production and dormant scrap as quickly as possible.

MODERN FOUNDRY METHODS

LOW COST MECHANIZATION BOOSTS PRODUCTION

Molding end of simple, inexpensive mechanized casting unit at Arrow Pattern & Foundry Co., Chicago. Unit is built around mechanical shakeout which cools and conditions sand, elevates it to overhead hoppers for molder convenience.

Shakeout end of unit shows bin receiving steaming sand. Only lifting and carrying required is over short distance between molding machine and conveyor track in background and between track and shakeout in foreground.

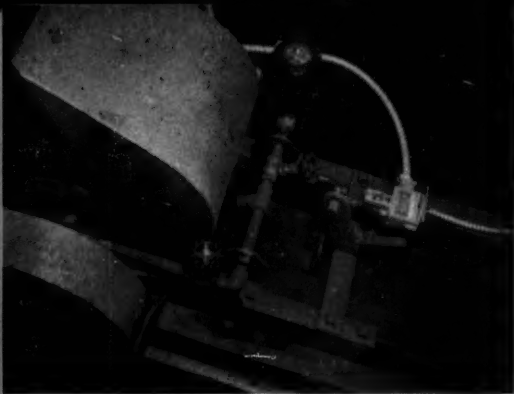
A small investment in mechanical facilities is paying big dividends for Arrow Pattern & Foundry Co., Chicago, according to Harry C. Swanson, vice-president and general manager of the organization. Mechanizing a two-molder production area of the plant, Mr. Swanson found that production increased 15 per cent the first day and was up another 15 per cent by the end of the week and is still soaring.

Arrow's new production unit provides for mechanical shakeout with automatic sand conditioning and cooling, elevation of conditioned sand to hoppers over molding machines, two track conveyors for molds with track return for bottom boards, and manually operated chain hoists and monorail for molten metal handling.

Entire production facilities exclusive of the melting department (also serves jobbing foundry) are bounded by two 32-ft track conveyors placed 15 feet apart. At one end, the two molders face each other at jolt-squeeze machines positioned under a split bin with hoppers and gates for sand delivery directly into the flasks. The gates open manually and close by gravity.

When he completes a mold, the molder turns and places it on the track conveyor positioned at convenient working height, moving it down the track toward the pouring area with a gentle shove. Cast aluminum bottom boards with three ball-bearing rollers move easily even when fully loaded, eliminate need for wheels or rollers on conveyor, and bearings are fully protected from molding sand. After shakeout, empty bottom boards return by gravity on a lower track, ready to be picked off

Arrow Vice-President Harry Swanson shows underside of cast aluminum bottom board with three ball-bearing rollers. Molds are pushed along track by hand, return to molding station on lower track by gravity. Three rails permit variety of bottom boards to be used. Size shown is 12 x 18 in., smallest expected to be used. Unusually large molds can be made on separate bottom board and placed on two rolling bottom boards.



Sand coming up inclined belt from shakeout, trips switch at right turning on three water sprays which moisten sand. Paddle wheel (cover has been lifted) gives sand first mixing treatment after wetting from nozzle in center of picture.

by the molder after he has positioned a completed mold.

Molds are made in snap flasks or pop-off flasks, and are banded before weighting. Weights, handled manually, are transferred from stands on either side of the shakeout to the molds prior to pouring and back to the stand or onto a neighboring mold during shakeout.

The shakeout and sand conditioning unit is located between conveyor tracks about half way down their length. In shaking out, molds are dumped manually onto a vibrating screen. Sand sifts onto an inclined conveyor belt. Castings are transferred from shakeout to tote bin or wheelbarrow with tongs. Heading up the inclined belt, the hot sand trips a switch actuating a solenoid valve. This starts three water sprays which cool and moisten the sand at three locations on the belt.

Immediately following the first spray, the sand is mixed and aerated by a paddle wheel, and is again aerated as it is thrown off the conveyor belt onto a coarse screen into the floor-level storage bin. Sand is taken off the bottom of this bin by a horizontal belt conveyor and dropped into the boot of a bucket elevator. At the top of the elevator the sand is aerated a third time as it is tossed into the divided overhead sand bin.

An electrical interlock keeps the bucket elevator and belt in the lower storage bin from running if the overhead storage bins are full.

Metal from four oil-fired furnaces is lifted with standard crucible tongs and chain hoist. Monorail does not extend outside hooded melting area; chain hoist for pouring picks up shank and crucible at edge of melting area. Melting department is kept free of fumes and heat by high-ceiling hood and ample natural draft.

Pouring monorail encircles entire molding area providing access to all points along both mold conveyor tracks. Monorail branches off to floor and bench molding areas not shown in these pictures to provide molten metal to all molders with minimum of manual effort.

33 1/3 % MORE CAPACITY

with the New 2F and 3F SIMPSON *Intensive* Mix-Mullers

FOUNDRY *Personalities*

Clifford E. Wenninger, director of foundry research, University of Kentucky, has joined the research and development department of National Engineering Co., Chicago. He will continue his affiliation with the university. **Robert Spurgin, III,** is foundry engineer for National Engineering in southern Ohio and Kentucky. He was recently in charge of engineering and development for Swayne, Robinson & Co., Richmond, Ind., where he has also been foundry superintendent and melting foreman.

Robert E. Kennedy, Secretary Emeritus of A.F.S., has been named assistant professor at the University of Illinois Navy Pier Branch, Chicago, where he has been in charge of the foundry laboratory for

R. E. Kennedy

several years. Holder of degrees from the University of Illinois and Winona Technical Institute, Mr. Kennedy taught foundry practice at the University of Illinois, Urbana, from 1910 to 1921, during which period he was also employed by several Midwestern foundries. In 1921 he was appointed assistant secretary of A.F.S., in 1925 technical secretary, and in 1938 secretary of the Society. Mr. Kennedy, who retired as secretary of A.F.S. in 1945, was awarded the A.F.S. Joseph S. Seaman Gold Medal that same year "for outstanding service to the foundry industry in organizing and guiding the development of technical and operating papers, and his untiring encouragement of A.F.S. chapters, committees and members."

Herbert M. Meyer, editor for Engineering Index, Inc., New York, has been named associate metallurgist in the metals research department, Armour Research Foundation of Illinois Institute of Technology, Chicago. Armour also announces the appointment of **Robert C. Sommer,** production assistant for Apex Smelting Co., Chicago, as research assistant in the same department.

M. G. Purpus has been named sales manager, Special Products Div., Black, Sivalls & Bryson, Inc., Kansas City, Mo. Mr. Purpus will supervise sales of such items as foundry flasks, will also serve as administrative assistant to general sales manager, **Henry A. Ruysser, Jr.**

Edward J. Walsh has been appointed executive secretary of the National Foundry Association, Chicago. **Charles T. Sheehan** has been appointed to assist in the program of NFA activities. The current program includes weekly bulletin service, biweekly labor case comments, annual wage

E. J. Walsh

C. T. Sheehan

survey, labor agreement reports, negotiation services, labor education, insurance planning, reports on legislative activities, Washington contact work, and management meetings.

C. K. Flagg has become steel foundry superintendent of Ross-Meehan Foundries, Chattanooga, Tenn. For the past 13 years he was metallurgist for Federal Steel Products Corp., Houston, Texas.

J. T. Jarman is the new assistant in charge of administration, personnel, and liaison for the research division of Allis-Chalmers Manufacturing Co., Milwaukee. Assistant directors of research are **A. K. Higgins** and **Will Mitchell, Jr.** Mr. Higgins is chairman of the A.F.S. Brass and Bronze Division.

General Donald Armstrong, president of United States Pipe & Foundry Co., Burlington, N. J., has resigned to accept

General Armstrong

an important post abroad in connection with economic mobilization in Europe. **N. F. S. Russell,** chairman of the board, has been elected president. **Hubert F. O'Brien,** president of A. P. Smith Mfg. Co., East Orange, N. J., is now a director of U. S. Pipe & Foundry Co. **James J. Reynolds, Jr.** will serve as assistant to the chairman of the board of directors of U.S. Pipe & Foundry Co.

John V. Munro, vice-president of Caterpillar Tractor Co., Peoria, Ill., announced his retirement, effective last December 31. **Tom H. Spencer** was appointed assistant to chief metallurgist **G. C. Riegel;** he will serve with **Frank Vaughn,** assistant chief metallurgist. **T. R. Farley,** former vice-president, will go to New York to establish a 360,000 sq ft replacement parts plant. **William L. Naumann** succeeds him as vice-president.

Harvey T. Harrison, vice-president of Duraloy Co., Scottdale, Pa., was recently

elected president of Alloy Casting Institute. Mr. Harrison is succeeded as vice-president of the Institute by **R. H. English,** chief metallurgist for National Alloy Steel Div. of Blaw-Knox Co., Pittsburgh. **W. H. Worrilow, Jr.,** Lebanon Steel Foundry, Lebanon, Pa., was elected to the board of directors.

Thomas N. Peck, director of the aluminum alloy division of Vanadium Corp. of America, New York, has been appointed deputy director of the aluminum and magnesium division of NPA. Chief of the aluminum ingot section, WPB 1943-44, Mr. Peck is a member of several organizations including A.F.S.

Lauriston C. Marshall will be director of Link-Belt Company's new physical testing and research laboratory at Indianapolis. Dr. Marshall has been professor of electrical engineering at University of California (Berkeley). He is currently head of the microwave laboratory operated there under the joint sponsorship of the U. S. Air Forces and the Research Corp. He is also an active member of the university's radiation laboratory staff, which has been conducting nuclear research for the AEC.

E. W. Claar has been appointed manager of Eastern Clay Products Dept. of International Minerals & Chemical Corp., Chicago. Mr. Claar, a director of Central Ohio Chapter of A.F.S., has written numerous technical articles.

John W. Meader, economist for Great Lakes Carbon Corp., New York, has been elected assistant vice-president of the corporation. Mr. Meader was economist for the New York Trust Co. for 10 years, and is a graduate of MIT.

Joseph McOrrly is now vice-president in charge of engineering at Edwin L. Wiegand Co., Pittsburgh. **Lester D. Drugmand** has been named his successor as chief engineer. **John W. Bailey** becomes vice-president in charge of industrial relations.

Vincent P. Gregg has been named manager of purchasing of non-ferrous materials for General Electric Co., Schenectady, N. Y.; **Bruce H. Bradbeer,** manager of purchasing ferrous materials; and **Herbert H. Schnell,** manager of factory equipment purchasing.

Edward S. Christiansen, president, Christiansen Corp., Chicago, has been named "Light Metals Man of the Year" by

E. S. Christiansen

Modern Metals magazine. This annual award is made to the man whose contribution to the light metals field is considered greatest.

J. Alfred Berger has been appointed acting head of the department of metallurgical engineering, University of Pittsburgh. Joining the faculty in 1940, he has served as lecturer in the metallurgical department and has been in charge of graduate work. In 1949 he was appointed associate professor. Previous to this time, he served as research metallurgical engineer and director of research for Molybdenum Corporation of America.

Fred Friedlieb is new sales manager of Admiral Die Casting Corp., Chicago. His previous affiliations include R. H. Campbell Co. and Motorola, Inc.

Geraldo Foz, Conexoes de Ferro Foz, Sao Paulo, Brazil, has been touring eastern and midwestern foundries studying malleable iron fittings production. Another purpose of the trip is to buy molding, melting, and sand handling equipment.

Harry H. Yeager assumed the position of general superintendent of plant operations for Harbison-Walker Refractories Co. on Nov. 26. He has been associated with the company since 1905, serving as superintendent of various plants and more recently as general district superintendent with headquarters in Pittsburgh.

Kenneth L. Holmes and **E. O. Mitchell** were recently appointed purchasing agent and assistant purchasing agent, respectively, by Chicago Pump Co., Chicago.

Horace M. Bringhurst was recently appointed assistant director of the Coke Div. of the Defense Solid Fuels Administration. Mr. Bringhurst had previously been employed by Semet-Solvay Div. of Allied Chemical and Dye Corp. since 1933. He is a graduate of the University of Washington.

William E. Moore, president of W. E. Moore & Co., engineers, and chairman of Pittsburgh Lectromelt Furnace Corp., was one of three men presented with gold keys by The Franklin Institute, Philadelphia, this month. Keys are symbolic of 50 years' membership in the Institute.

(Continued on Page 90)

Bull Ring to Bull Ladle Is Saga of Mexico City Foundryman

An amateur matador of some note is Mexico City Chapter Vice-Chairman Juan Latapi of Fundiciones de Hierro y Acero S.A., who two or three times a year takes part in a bullfight at Mexico City. As shown in the above photographs, Senor Latapi, with sword and muleta in hand, moves in for the final and most dangerous act in this hazardous sport — killing of the bull.

SAND PREPARATION WITH A ROYER IS A BIG "PROFIT MAKER"

Sand conditioning costs hit a new low when a Royer Sand Separator and Blender is used. From four to fifty tons of molding sand per hour (depending on the model) can be prepared at one-half the cost of manual conditioning. Model NC-2 illustrated above conditions 12 to 15 tons per hour. This saving must reflect itself in your profit statement. The high percentage of elimination of blows and runouts and the smoother casting surfaces resulting from the use of properly conditioned sand are additional favorable factors in your overall costs. Greater production with less manpower, a reduction in rejects and minimum cleaning and grinding time all add up to INCREASED profits.

The Royer handles the six major steps in correct sand preparation — it removes trash; reduces sand to uniform, lump free texture; blends and mixes; distributes moisture evenly; increases permeability and double aerates. The finished product is an open, gas-free velvety textured sand — ready for the molder's use.

There are sizes and models available to fit your needs — in capacities from 4 to 50 tons per hour.

Bulletin 744 gives full details on all Royer models. Write for it.

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

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Here's the LIFESAVER for your FURNACES, CRUCIBLES...

...and this is the Coating Method that will increase your non-ferrous metals melting production...

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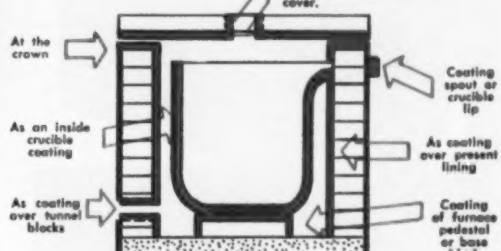

This HY-TEMP REFRACTO quick setting cement, PLASTI-BOND, offers you the refractory plus-factors that transform "down-time" hours into pounds of metal melted.

As a coating on the furnace crown, PLASTI-BOND prevents "chewing out" of lining through fusion of furnace cover and crown—as pedestal coating it prevents adherence of crucible to stool—its unusual high temperature resistance prevents heat deterioration of tunnel blocks—its quick-hardening characteristics and stamina resist abrasive wear in furnace and crucible spouts. In all non-ferrous metal-handling equipment, this HTR air setting cement protects lay-up brick and joint material by sealing such residual linings and preventing porosity, gas holes or pin holes.

Resistant to slag and other harmful oxides that adhere to ordinary linings, PLASTI-BOND protects metals in heat from contamination and analysis breakdown. Broad field experience has proven that this HTR super-refractory, plastic in substance, will prolong the heat-life of the furnace and INCREASE CRUCIBLE-LIFE 50% TO 100%!

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BONDING CEMENTS • ELECTRIC FURNACE LININGS AND BOTTOMS

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STACK MOLDING with Sterling Steel Flasks Greatly Increases Production

It's really amazing how much you can increase your foundry casting output by employing Sterling stack molding flask sections. You'll find them especially ideal for long runs of small or shallow castings. Molds are made in flask sections stacked one above another, to a height of 10 or 12 sections. The increased amount of hot metal in relation to the total flask volume generates tremendous heat with corresponding increase in gas pressure. That's why Sterling Steel Flasks are ideal for this modern method of molding. Sterlings are constructed of special rolled steel channel with reinforcing rib to prevent distortion and misalignment of the stacked molds. The flasks retain their rigidity and accuracy under constant production pressure. It will pay you to investigate. Write today.

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MILWAUKEE 14, WISCONSIN, U. S. A.

Stack Molding in a large production foundry. A common sprue, through the stack, feeds molten metal to runners leading to individual casting cavities.

Backed by 42 Years' Experience Producing Foundry Equipment

SPOT TESTS IDENTIFY 9 METALS

Simple reagents and equipment for making spot tests to identify nine common metals and alloys. Small magnet is used to determine stainless steel 430 and to recheck identification of nickel.

These simple tests, easily made, can identify nickel and other strategic metals for recovery to stretch critical supplies. All that is needed are hydrochloric acid, nitric acid, potassium ferricyanide, a magnet, and a small medicine dropper to apply reagents.

IN SCRAP SALVAGE, despite the greatest care in control, mix-ups are bound to occur. There has long been a need for simple tests that can be made on the spot without the need for thorough laboratory analysis. Such spot tests are also useful in the recovery of metals and alloys in worn-out or obsolete machinery and other equipment.

The Development and Research Div. of International Nickel Co., Inc., has outlined some simple and easily carried out tests for the identification of nine white metals and alloys in general use today. Included are nickel, Monel, Inconel, Incoloy, 70/30 cupro-nickel, and four types of stainless steel—304, 310, 321, and 430.

All of these are of medium density. Light metals (such as aluminum and magnesium) and heavy metals (lead and silver) can be distinguished by weight. All tests are necessarily qualitative, as quantitative results require chemical or spectrographic analysis.

Reagents consist of 1:1 and 10 per cent hydrochloric acid, 1:1 and concentrated nitric acid, and 10 per cent potassium ferricyanide. Equipment consists of a magnet and a small medicine dropper or glass rod. Before tests are made, the specimen must be cleaned thoroughly; rubbing with emery paper is usually satisfactory for this purpose.

The nine white metals can be divided into two basic groups: Group A, containing Incoloy and the stainless steels; and Group B, containing the nickel and nickel-base alloys. To determine basic group, add one drop of 10 per cent hydrochloric acid to the unknown metal and allow it to react for one minute. Then add one drop of 10 per cent potassium ferricyanide solution and observe at the end of 30 seconds. If a dark green or blue color results, the unknown is in Group A. If there is no color, or a red, green, or yellow-brown color, the unknown is in Group B.

Testing in Group A

Test with a magnet. If the unknown is definitely magnetic, it is stainless steel 430.

Add a drop of 1:1 hydrochloric acid and allow it to react for one minute. Then add one drop of 10 per cent potassium ferricyanide solution and observe at the end of 30 seconds. If the drop is white with a black edge, the unknown is stainless steel 310.

If the drop is green or bluish green, the unknown is Incoloy, stainless steel 304, or stainless steel 321. There are no spot tests which will distinguish accurately among these three alloys; the test must be repeated using known materials as standards and comparing the reactions.

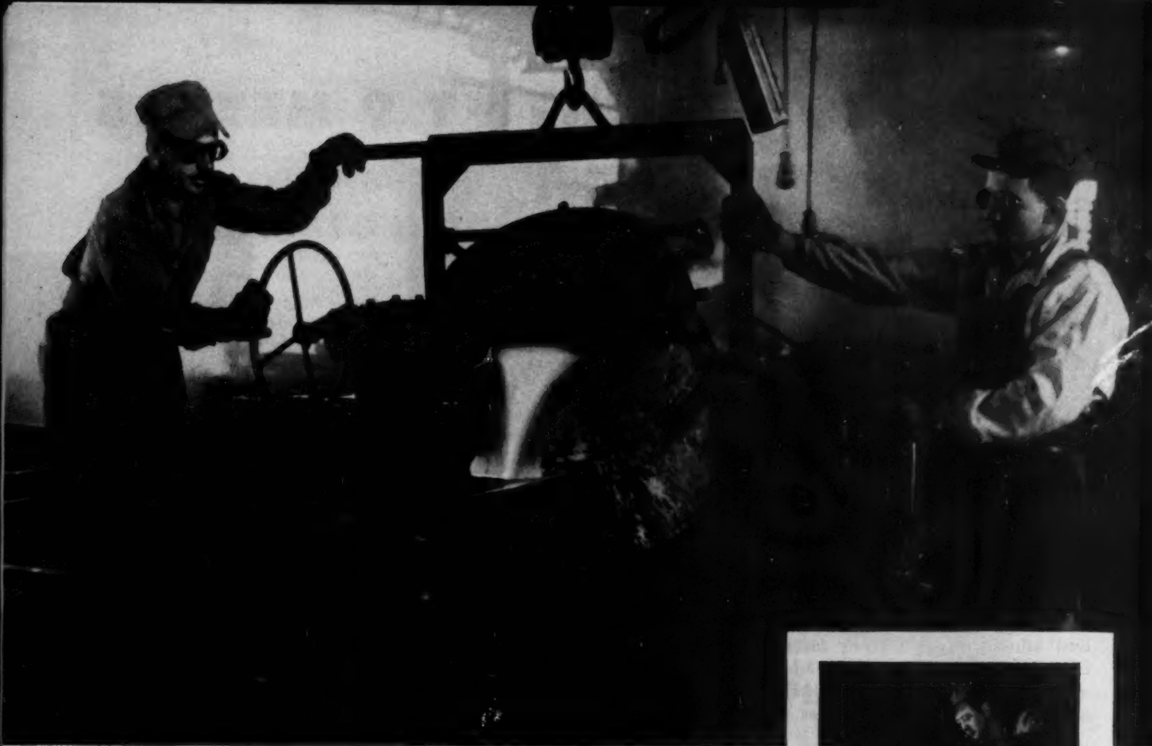
Testing in Group B

Add a drop of concentrated nitric acid and observe after one minute. If no action occurs, the unknown is Inconel.

If the drop is a clear, pale green color, the unknown is nickel. Confirm with a magnet, as nickel is definitely magnetic.

If the drop is cloudy and blue-green, the unknown is Monel or 70/30 cupro-nickel. To distinguish between these, add one drop of 1:1 nitric acid to a clean portion of the unknown and observe after five seconds. If the drop is bright green, the unknown is Monel. If there is vigorous gassing and the drop is a pale, blue-green color, the unknown is 70/30 cupro-nickel.

These tests are detailed in a 4-page bulletin, *"First Aids in Scrap Salvage."* In addition, procedures for identifying more than 125 metals and alloys are outlined in *"Rapid Identification of Some Metals and Alloys."* Both may be obtained without charge by writing to Technical Service Section, Development and Research Div., International Nickel Co., Inc., 67 Wall St., New York 5.



McNALLY-PITTSBURG Found Why Heavy Duty BS&B FOUNDRY FLASKS *Stand Up Longest!*

TYPE FP22

Cross Section of Flask wall showing wall thickness, bearing bar size and welding. Reinforcing rib is optional.

McNally-Pittsburg, one of the world's greatest producers of heavy mining equipment have more than 300 BS&B Heavy Duty Foundry Flasks in their modern foundry at Pittsburg, Kansas. Over the past seven years these BS&B Flasks have proved to this firm that they stand up longest in heavy service, with the lowest maintenance and replacement cost and the greatest over-all economy in casting.

The secret of this flask's stamina lies in the stronger, double-welded construction. The bearing bars are securely welded to the walls both inside and outside. The bearings can't break down, the section separate or deform. As a result, maintenance is cut to a minimum, even under the hardest use. It will maintain its original dimensions and pincenters over a longer period of time.

BS&B lightweight, medium duty and heavy duty foundry flasks are made in round, square, rectangular shapes. Pinlugs, available in all styles, are standard equipment and can be had in any arrangement or combination you desire. Special flasks can be made to your specifications.

YOUR FREE COPY ***of the BS&B Foundry Flask Catalog will be sent promptly on request. It's a most useful foundryman's handbook with complete diagrams, specifications, tables and an easy-to-order system.***

BS&B

BLACK, SIVALLS & BRYSON, INC.

Foundry Flasks Division

Dept. 7-AQ2 7500 East 12th Street Kansas City 3, Missouri

NEWS OF A.F.S. TECHNICAL COMMITTEES

Foundry Sand Handbook Out Next Month

FOUNDRY SAND HANDBOOK, thoroughly revised and expanded, will be issued in March. Rewritten completely by a committee of sand specialists, the new volume covers testing, interpretation of tests, proper use of foundry molding materials, and typical mixtures.

The new volume contains more than twice as much information as the preceding edition, FOUNDRY SAND TESTING HANDBOOK. Elimination of "testing" in the title of the new book emphasizes its comprehensive nature.

Sections of the FOUNDRY SAND HANDBOOK include: Mode of Occurrence of Sands and Clays, Methods for Sampling Foundry Sands and Clays, Preparing Foundry Sand Mixtures for Testing, Methods of Testing Molding Sands, Chemical Analysis of Sand, Testing of Cores and Binders, Foundry Control Methods for Cores, Testing Core Pastes, Interpretation of Room Temperature Sand Tests, Testing Equipment, and Molding Sand Mixtures.

The new book contains a glossary of terms used in foundry sand work and an extensive bibliography on sand testing and control.

Sand Division Committee 8-L

COMMITTEE on Steel Foundry Sands at Elevated Temperature met in Chicago December 19 to discuss progress and plans for research at Cornell University.

Opening the meeting, R. G. Thorpe of Cornell University summarized a written progress report previously sent to committee members as follows:

Purpose is to establish data for evaluating expansion characteristics of sand mixtures to get information on sand expansion and its relation to casting defects. Recorded strain on the equipment used is less than that obtained when deformation values are recorded by means of a film record of dial indicators.

Following discussion, it was decided that as long as the relative error remained the same, the tests should continue, since with a constant difference data can always be correlated by correcting for this difference in measurements.

Harry W. Dietert, Harry W. Dietert Co., Detroit, suggested that a preload of 30 lb be applied to the specimen and a load of 700 lb within the following 15 seconds to eliminate free loading error. He also recommended that a rubber stopper be used as a specimen to establish characteristics of the equipment. Mr. Thorpe agreed to this and will check equipment.

In discussing whether to designate such measurements as "stress-strain" or "hot deformation," it was decided that the average foundryman is more familiar with the term "hot deformation." It was further decided that Sand Division Chairman Clyde A. Sanders, American Colloid Co., Chicago, appoint a committee to develop terminology for testing of sands.

Present studies will be extended to include increase as well as decrease of clay content in all mixtures, but moisture content will be held constant. Further work will be done on green sand mixtures, as well as dry sand mixtures.

In conclusion, the committee authorized the purchase of a stress-strain recorder for the dilatometer in use at Cornell. Progress report on work at Cornell will be presented at the 1952 International Foundry Congress in May.

Attending were: Chairman J. H. Lowe, Wehr Steel Co., Milwaukee; Harry W. Dietert, Harry W. Dietert Co., Detroit; R. E. Morey, Naval Research Laboratory, Washington, D. C.; D. C. Williams, Ohio State University; Clyde A. Sanders, American Colloid Co., Chicago; R. G. Thorpe, Cornell University; J. S. Vanick, International Nickel Co., New York; and A.F.S. Technical Director S. C. Massari.

Steel Division Research

MEETING RECENTLY at Burnside Steel Foundry Co., Chicago, where hot tear investigations have been conducted during the past year, the Steel Division Research Committee heard reports by Committee Chairman Clyde Wyman, C. A. Faist and G. DiSelvestro, all of Burnside Steel Foundry Co., on these investigations.

Reproducibility of test results obtained under conditions of the hot tear tests was excellent, and Burnside's staff plans to duplicate the entire series of tests to confirm reproducibility of results.

The committee decided that Armour Research Foundation should conduct a similar group of tests after building new core box equipment. In order to make a comprehensive progress report available to all A.F.S. members on the investigation to date, Armour Research Foundation was designated to prepare introductory material. This material is to outline results of experiments at Armour, American Steel Foundries and at Burnside, and will be presented at the 1952 A.F.S. International Foundry Congress in Atlantic City.

Attending were: Chairman Clyde Wyman, Burnside Steel Foundry Co., Chicago; Gordon Johnson, Armour Research Foundation, Chicago; C. H. Lorig, Battelle Memorial Institute, Columbus, Ohio; Steel Chairman Clyde B. Jenni, General Steel Castings Corp., Eddystone, Pa.

H. A. Young, Crane Co., Chicago; G. W. Johnson, Vanadium Corp. of America, Chicago; Harry W. Dietert, Harry W. Dietert Co., Detroit (representing A.F.S. Board of Directors Research Committee); C. A. Faist and G. DiSelvestro, Burnside Steel Foundry Co., Chicago; and A.F.S. Technical Director S. C. Massari.

Pattern Division

TENTATIVE PLANS were formulated for Pattern Division sessions at the 1952 A.F.S. International Foundry Congress by the Pattern Division Executive Committee, meeting December 3 at the Congress Hotel, Chicago, under the chairmanship of E. T. Kindt, Kindt-Collins Co., Cleveland.

First, Division Vice-Chairman Harry Lees, Whitin Machine Works, Whitinsville, Mass., reviewed plans to date. Next, the committee finalized plans for the 1952 International. As approved, this will include a Pattern Round Table Luncheon on *"Trends in Patternmaking"* and *"New Methods in Metal Patternmaking"*; a technical session at 10:00 a.m., May 2, on *"Making Aluminum Core Boxes and Driers from Core Plugs"* and *"Patternmaking for the Shell Molding Process"*; and at 2:00 p.m., May 3, technical session on *"Patterns for Malleable and Steel Foundries"* and *"Practical Construction of Wood Patterns."*

A.F.S. Technical Director S. C. Massari brought up the subject of a new pattern color standard, and it was decided that A.F.S. Headquarters should send copies of the proposed standard to all members of the Pattern Division and to members of Executive Committees of Gray Iron, Malleable, Brass & Bronze and Aluminum & Magnesium Divisions for comment.

Attending were: Chairman Kindt, Vice-Chairman Lees; Frank C. Cech, Cleveland Trade School; W. H. Dashiell, Kindt-Collins Co., Cleveland; Albert F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee; Vincent J. Sedlon, Master Pattern Co., Cleveland; H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind.

Ontario Chapter Publishes Film List

AGAIN THIS YEAR, A.F.S. Ontario Chapter is making a series of 16 mm. sound films on foundry practice available to foundries and communities within its area. Films and instructions are available at $35 for the series, or $3 each, with the exception of *"Fluid Flow in Transparent Molds—II,"* which is $5.50. Advance bookings must be made from Frank B. Diana, Z. Wagman & Son, Ltd., 190 Edwin Ave., Toronto 9.

Films available include:

Bench Molding: OE 423, Bench Molding with a Loose Pattern (21 min); OE 424, Making a Simple Core (15 min); OE 425, Molding Part Having a Vertical Core (19 min); OE 426, Molding with a Split Pattern (19 min); OE 427, Molding with a Gated Pattern (11 min).

Floor Molding: OE 428, Floor Molding with a Loose Pattern (24 min); OE 429, Molding Part with a Deep Green Sand Core (25 min); OE 430, Molding a Valve Body (26 min); OE 431, Molding a Horizontal Cored Part (22 min); OE 432, Molding with Three-part Flask (35 min).

Machine Molding: OE 433, Molding on a Jolt Squeeze Machine (10 min); OE 434, Molding on a Jolt Rollover Pattern Draw Machine (23 min).

Cupola Practice: OE 436, Prepare a Cupola for Charging (21 min); OE 437, Operating a Cupola (14 min).

General: "Fluid Flow in Transparent Molds—II," with lecture papers (30 min); *"New Foundry Horizons,"* film on foundry mechanization (30 min).

Enjoying themselves are some of the more than 400 foundrymen and their ladies who celebrated the Yule season at the Twin City Chapter's Christmas Party, held in December at the Hotel Nicollet, Minneapolis.

CHAPTER ACTIVITIES NEWS

Southern California

Alfred A. Grant
Grant & Co.
Publicity Chairman

MORE THAN 380 foundrymen and their guests enjoyed the chapter's Christmas Stag, held December 8 at the Lakewood Country Club. Following an excellent prime rib of beef dinner were prize drawings and two-and-a-half hours of top entertainment.

The Chapter wishes to thank members of the Entertainment Committee, headed by William Baud of Mechanical Foundries Division, Food Machinery Corp., for a fine job. Other members of the committee are: Stanley Brand, Snyder Foundry Supply Co.; Paul Clapp, Warren Foundry; Robert Ditmore, Federated Metals Div., American Smelting & Refining Co.; Ray Dorcey, Westlectric Castings, Inc.; John Hyatt, Grant & Co., Art Lamp, Independent Foundry Supply Co.; James Oliva, Oliva Supply Co.; Ray Orr, Howell Foundry; Warner Stenberg, United States Motors; Anthony Tuzzolino, Overton Foundry; and Ed Worth, Mechanical Foundries Div., Food Machinery Corp.

Pennsylvania State College

DECEMBER MEETING was held in the foundry classroom with 24 members and guests present to hear Dr. D. C. Williams of Ohio State University discuss *"Molding Sands."*

Guests included T. C. Jester, Darling Valve & Mfg. Co., Williamsport, Pa.; the Student Chapter's technical advisor; Max Persun, Sprout & Waldron, Muncy, Pa.; and Lloyd Leesburg, Superior Foundry, Inc., Cleveland.

Central Michigan

J. T. Ehman
Albion Malleable Iron Co.
Publicity Chairman

NOVEMBER AND DECEMBER were active months for Central Michigan Chapter, with a regular meeting November 28, a Cupola Course December 5, 6 and 7, and the chapter's Annual Christmas Party at Battle Creek on December 14.

November 28 meeting, attended by 120 members, opened with Chapter Chairman Thomas T. Lloyd, Albion Malleable Iron Co. thanking Al Rhoads and the personnel of Engineering Castings, Inc., Marshall, Mich., for being hosts to the chapter on a plant visit preceding the meeting.

Technical Chairman Jack Secor, Hill & Griffith Co., introduced the evening's speaker, William M. Hambley, Chas. A. Krause Milling Co.

Mr. Hambley opened his talk by

More than 500 foundrymen, suppliers and their guests enjoyed a turkey and

describing the relationship between casting defects and policies and practices of management.

The second part of his talk consisted of slides showing various casting defects and the problems involved in correcting them. Mr. Hambley devoted the remainder of his talk to answering practical and theoretical questions put to him by the audience.

Cupola Practice School, held at Battle Creek December 5, 6 and 7, was presented by B. P. Mulcahy, Fuel Research Laboratory, Indianapolis, with David Boyd, Engineering & Castings, Inc., Marshall, Mich. as chairman.

Fifty-two chapter members attended the comprehensive course, which included such topics as physical characteristics, fuel, wind, raw materials, fluxing, metal temperatures, mechanical charging and metal composition.

Course was held on an informal basis, with the audience interposing its problems as each subject was covered. Mr. Mulcahy answered questions with direct and precise information as they were introduced.

Missouri School of Mines

Jack H. Thompson
Chapter Reporter

JOINT MEETING of the St. Louis chapters of A.F.S. and ASM was held at Missouri School of Mines December 12 to acquaint members of both organizations with the School, its faculty and its methods.

Short talks describing various phases of Metallurgy Department work were given by Dr. A. W. Schlechten on metallurgy; Dr. D. S. Eppelsheimer on foundry; Professor Legstein on mineral dressing; and Dr. H. R. Hanley on the history of Missouri School of Mines' Metallurgy Department.

Following the talks, the group was

A few of the many foundrymen who attended Central New York Chapter's Annual Christmas Party at the Hotel Onondaga's Roof Garden, Syracuse.

Headliners at Western New York Chapter's December 7 meeting were (left) Meeting Technical Chairman John R. Wark, Wark Foundry Services, Inc., and Speaker Joseph A. Gitzen, Delta Oil Products Co., Milwaukee, Wis.

seafood dinner and a sparkling floor show at Metropolitan Chapter's Annual Christmas Party on December 7.

Celebrating Central New York Chapter's "International Night" January 11 were, from left, A.F.S. National Secretary-Treasurer Wm. W. Maloney; A.F.S. National Directors Martin J. O'Brien, Jr., Symington-Gould Corp., Depew, N. Y., and L. D. Wright, U. S. Radiator Co., Geneva, N. Y.; Chapter Chairman William D. Dunn, Oberdorfer Foundries, Inc., Syracuse; National Director Vincent J. Sedlon, Master Pattern Co., Cleveland, evening's speaker; Vice-Chairman D. J. Merwin, Oriskany Malleable Iron Co.

Several hundred foundrymen and their guests enjoyed themselves hugely at Northeastern Ohio Chapter's Annual Christmas Party on December 13.

Talking over plans for Eastern New York Chapter's "International Night" at a chapter directors' session preceding the January 10 meeting were, from left: A.F.S. National Director L. D. Wright, U. S. Radiator Co., Geneva, N. Y.; A.F.S. National Secretary-Treasurer Wm. W. Maloney; and Chapter Chairman John E. Waugh, General Electric Company, Syracuse, N. Y.

taken on a tour through the MSM Metallurgy building and Foundry, where demonstrations and exhibits were conducted by students and faculty.

Metropolitan

Andrew Devlin
Daniel Goff Co.
Chapter Reporter

FORMAT of dinner and talk was supplanted in December by the chapter's Annual Christmas Party, when more than 545 foundrymen and suppliers met for a turkey and seafood dinner and an evening of gayety at the Essex House, Newark, N. J., December 7. Party Committee, with Howard Voit, Sterling Wheelbarrow Co., as chairman, made good its promise of a festive program, which included a floor show in which chapter members took part and were taken apart, and distribution of door prizes.

Those attending were unanimous in their decision that a vote of appreciation be extended the party Committee. Members are:

Chairman Howard Voit; Dan Polderman, Whiting Corp.; Frank Eliason, Pennsylvania Foundry Supply Co.; Ernest Miller, Bethlehem Steel Corp.; Charles Schwalje, Worthington Pump & Machinery Corp.; Daniel Talbot, Cooper Alloy Foundry Co.; Ben Beldin, Whitehead Bros. Co.; Philip Gray, Whiting Corp.; H. A. Deane, American Brake Shoe Co.; William Taylor, Taylor & Co.; William Lawson, Springfield Facing Co.; John Bing, Metropolitan Refractories Corp.; and H. Robinson, Republic Steel Corp.

Central New York

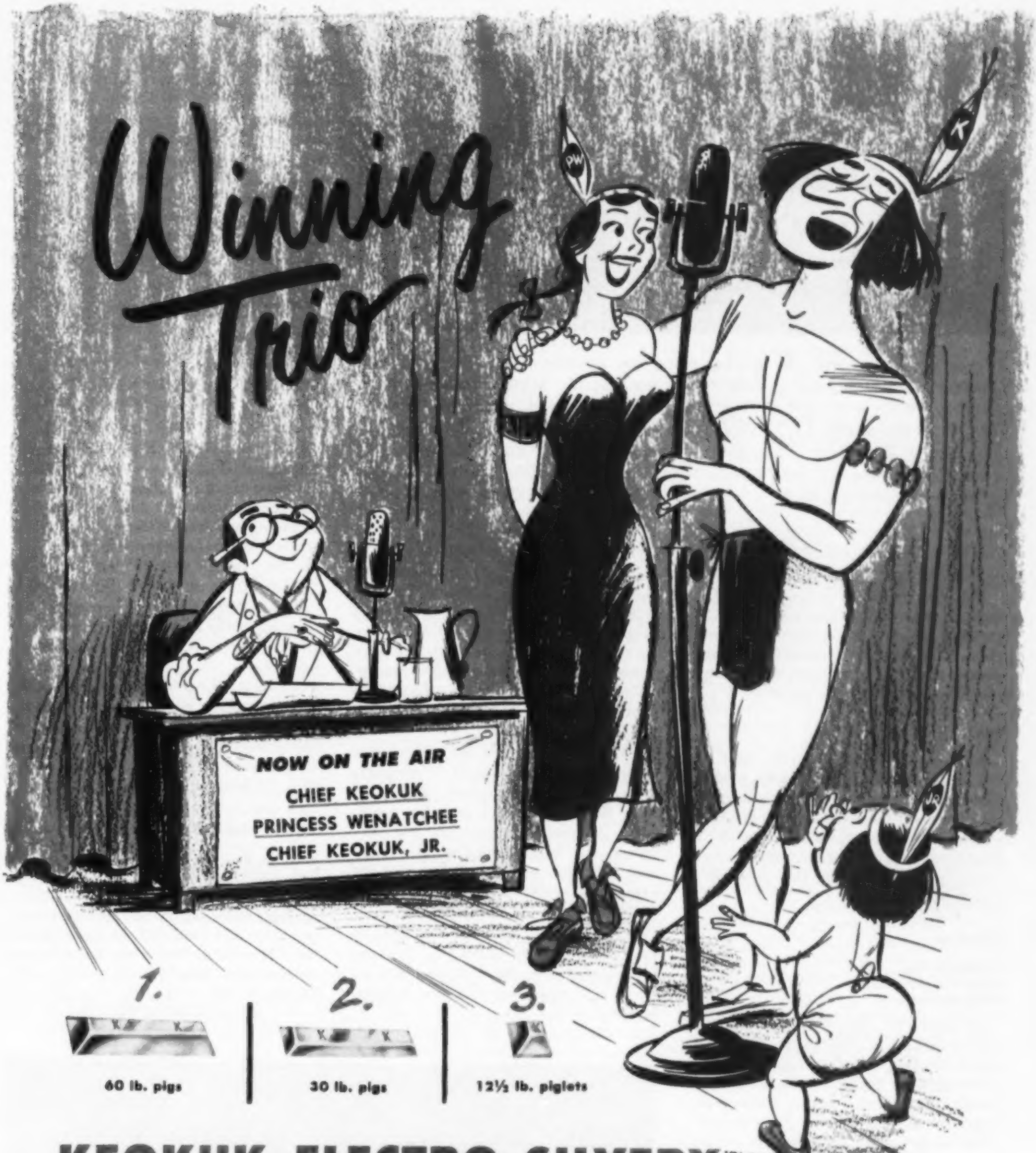
J. A. Feola
Crouse-Hinds Co.
Chapter Reporter

JANUARY 11 MEETING, designated "*International Night,*" was held at the Onondaga Hotel, Syracuse, with more than a hundred foundrymen present.

Opening the program, A.F.S. National Director Martin J. O'Brien, Jr., Symington-Gould Corp., Depew, N. Y., gave a short talk on housing and other facilities for the 1952 A.F.S. International Foundry Congress & Show in Atlantic City, May 1 through 7.

A.F.S. National Secretary-Treasurer Wm. W. Maloney, the next speaker, congratulated Chairman William D. Dunn and the chapter on a successful membership drive and the excellent meeting attendance. Mr. Maloney then outlined the technical program and highlights of the forthcoming International Convention in Atlantic City, where U. S. foundrymen will be given the opportunity to meet many of their brothers-in-craft from overseas.

Principal speaker was A.F.S. National Director V. J. Sedlon, Master Pattern


Winning Trio
NOW ON THE AIR
CHIEF KEOKUK
PRINCESS WENATCHEE
CHIEF KEOKUK, JR.
1.
60 lb. pigs
2.
30 lb. pigs
3.
12½ lb. piglets

Preparing to present the grand prize, an electric roaster, at Mo-Kan Chapter's Christmas Party, held December 7 at the Hotel President, Kansas City, Mo., were, left to right: Chapter Treasurer Herman Schwickrath, Prier Brass Mfg. Co.; Vice-Chairman John Redman, Jr., Redman Pattern Works; Mrs. Henry Deterding, winner of the prize; and Chairman E. C. Austin, Jr., National Aluminum & Brass Foundry. Photograph courtesy of Henry Deterding, Sonken-Galamba Corporation, Kansas City, Kansas.

Co., Cleveland, who discussed *"Factors in Purchasing Patterns."*

Mr. Sedlon described the several types of materials that can be used for patterns and told when and how to use them. Production required should govern the type of pattern equipment to be built, Mr. Sedlon concluded.

Mo-Kan

ANNUAL CHRISTMAS PARTY, held at the Hotel President, Kansas City, Mo., December 7, was attended by some 270 members and their guests, who enjoyed a six-course turkey dinner, followed by distribution of favors and prizes and dancing to the music of Dee Peterson's orchestra.

Oregon

Norman E. Hall
Electric Steel Foundry Co.
Publicity Chairman

SEVENTY-TWO members and guests gathered in the Florentine Room of the Columbia Athletic Club, Portland, November 14 to hear Ralph L. Lee, Grede Foundries, Inc., Milwaukee, speak on *"Do You Know Your Costs?"*

Stressing the importance of accurate cost keeping, Mr. Lee pointed out that sound cost methods have shown foundrymen advantages of the "price per piece" over the "price per pound" method of determining casting costs.

Mr. Lee concluded his talk with an informal discussion of questions from the floor regarding local costs problems and methods.

C. Neal Wilcox, Electric Steel Foundry Co., co-chairman of the Educational Committee, outlined a five-point program of assistance to the student chapter at Oregon State College as follows: (1) arranging for speakers from Portland foundries to address student chapter meetings; (2) assistance to students who wish summer employment in local foundries; (3) arranging for plant tours of local foundry plants; (4) accumulation of old foundry equipment for use of the students in the college shops; and (5) notifying student chapter members of all Oregon Chapter meetings.

Mr. Wilcox stressed the importance of this program and urged all members to give it their full support, particularly in the collection of foundry equipment. In the short time that the committee has been functioning a great deal has been accomplished and a lot of equipment has already been donated by local plants for the college shops.

Membership Chairman Norman Rupp of Carborundum Co. outlined his program for the year and has set up a well-organized plan for a membership drive.

Tri-State

J. G. Winget
Reda Pump Co.
Chapter Reporter

LADIES were honored guests at the Annual Christmas Party, attended by some 60 foundrymen and guests.

First event of the evening was a gay and informal social session, with the M. A. Bell Co. and Cities Service Oil Co. as hosts. Following this was a delicious dinner and dancing.

Western New York

Marve Taublieb
Frederic B. Stevens, Inc.
Publicity Chairman

DECEMBER MEETING featured a talk by Joseph A. Gitzen, Delta Oil Products Co., Milwaukee, on *"Sand Additives."* Mr. Gitzen first outlined the history of foundry molding practices. He then discussed the effect of excessive moisture in sand, and outlined uses of facing materials. Causes and effects of core failures were presented by the speaker, along with a description of the chemical reaction of core additives.

In conclusion, Mr. Gitzen told how to test cores, and urged foundrymen not to use sand additives in excessive quantities.

Technical Chairman for the meeting was John R. Wark, Wark Foundry Services, Inc. Concluding feature of the program was the New York State Department of Public Works sound film, *"Thruway of Tomorrow."*

Eastern New York

Robert A. Rege
Eddy Valve Co.
Publicity Chairman

CHAPTER'S Board of Directors met January 10 with A.F.S. National Secretary-Treasurer Wm. W. Maloney to discuss plans for the forthcoming A.F.S. International Foundry Congress &

(Continued on Page 78)

Conducting Central Michigan Chapter's recent three-day Cupola School on December 5, 6 and 7 were B. P. Mulcahy, Fuel Research Laboratory, Indianapolis; Technical Chairman Patrick Settanni, Albion Malleable Iron Co.

LETTERS TO THE EDITOR

Query Hot Blast Author

The article in the November 1951 issue of AMERICAN FOUNDRYMAN by L. G. Berryman describing the small hot blast cupola at Texas A & M College has me guessing. He states that he is using a small centrifugal blower with a blast pressure of 14.7 psi. I doubt if this blower can produce such a pressure, although it would take a high pressure to force the air around the annular space.

The scheme of utilizing the waste heat for preheating the blast is simple but falls short of reclaiming much of the waste heat. Many attempts have been made similar to this but most have been discarded.

If fins were welded to the inner shell of the Berryman hot blast cupola, more heat would be transmitted to the air in the annular shell. Not much savings are affected unless the preheated air is about 900 F. If the hot gases could be made to swirl around the stack, thus maintaining longer contact, more heat would be transferred.

I have pulled the hot gases from the stack just above the charging door and used them mixed with air that flows in through the charging door for combustion air. This air had a high percentage of combustion products but sufficient oxygen to support efficient combustion.

ERNEST F. FISHER
Los Angeles

The article on the air preheater unit for small cupolas in the November issue of AMERICAN FOUNDRYMAN interests me. Our company has spent considerable time in the cupola business and presently is manufacturing hot blast equipment.

In the design of a cupola we are presently building, we are concerned with the temperatures at the top of the stack, the temperatures at the charging door and the conditions under which these temperatures are taken. We are also interested in the CO_2 and CO in the flue gas.

FOUNDRY EQUIPMENT MANUFACTURER

Berryman Replies

The actual blast pressure in the wind box was only about 10 ounces above atmospheric pressure. In my article I failed to mention in connection with Fig 3. and 4 that air supply had been converted to 68 F and 14.7 psi in accordance with common engineering practice. The actual blast temperature varied between 450 and 500 F.

I was not aware that many attempts at designs similar to the heat exchanger we described had been discarded. As pointed out in my conclusions, the steel inner shell should be cheaper than the conventional brick lining. In addition, it is supplying preheated air satisfactorily which the brick lining cannot do. Furthermore, the temperature of the air can be increased merely by increasing the length of the heat exchanger. I believe this will be cheaper than welding fins on as suggested.

I agree that if the hot flue gases were made to swirl around the stack, the air being preheated would more than likely absorb more energy and become hotter. The added cost of construction would be difficult to justify.

I question the figure of 900 F as being a practical lower limit as a criterion for the justification of a successful preheater. Certainly if the blast exists at any temperature above room temperature because of a heat exchanger that does not require an additional expense of operation as well as heavy initial expense, it should represent a saving to the foundry.

My first conclusion to the paper reveals that the friction heat in the preheated air system, as compared to the cold blast system, is about 20 per cent greater. This is a distinct disadvantage. It will require that a large blower be employed in order to deliver the same quantity of air to the wind box. While this will increase the power bill it will be offset by the savings in the coke bill.

For measuring temperatures, a standard chromel-alumel thermocouple was inserted through the brick lining and extended out to the center line of the cupola. Care was exercised to insulate the wires of the thermocouple in order to obtain the true temperature at the entrance of the counter flow heat exchanger. The thermocouple was connected to a recording potentiometer.

A similar arrangement was made at the top of the stack for the purpose of measuring the temperature of the exhaust gases, but an iron-constantan couple was used.

To calculate combustion efficiency, it was necessary to know the composition of the flue gases. A $\frac{1}{4}$ in. sampling pipe was run from the top of the stack down to the charging platform. An aspirator bulb was used to pump a flue gas sample from inside the stack and near its center into a glass gas sampling bottle. Samples were obtained about every eight minutes during a heat. They were analyzed in the conventional Orsat gas analyzer for carbon dioxide, carbon monoxide, and oxygen. For continuous work, an analyzer that automatically analyzes and records gas composition would be desirable.

LLOYD G. BERRYMAN, *Assoc. Prof.*
Mechanical Engineering Dept.
Texas A & M College

Nodule Formation

The comments of Messrs. Rehder and Donoho (Letters to the Editor, AMERICAN FOUNDRYMAN, December 1951, page 66) to our *"Note on the Spherulization of Graphite in Cast Iron"* in the October issue of the magazine are good examples of the many written and oral queries received since publication.

Before answering their specific questions, it may be well to outline the three major lines of thought which seem to persist in the comments made to date. They are: (1) nodular graphite is primarily due to some specific nucleus; (2) interfacial energy relationships are solely responsible for the final shape; and (3) regardless of how graphite nucleates or what its *original* external form, growth conditions determine the final shape of the nodule.

In spite of much time and effort expended, no definitive experiments exist (as yet) to establish any viewpoint. According to our original note, however, we believe the last two viewpoints must eventually become one; we showed there already exists evidence in fields other than cast iron metallurgy that the adsorption viewpoint is the most tenable by analogy.

Graphite can be nucleated directly by foreign seeding agents or spontaneously without seeding. Many different seeding agents such as oxides, silicates, sulphides, and carbides of such diverse elements as cerium, magnesium, titanium, and manganese may well serve this purpose without specificity. In this sense only, do we consider our use of the observation "magnesium in some way stimulates nucleation."

We believe it is immaterial how the nucleus originates or whether it is born in the shape of a plate, rhomboid, or sphere. Most important is what happens during its growth to final shape. The fact the melt be low in sulphur, and that magnesium adsorbs on the usually fast growing faces of the flake, is vital; such adsorption, we conclude, would slow down growth in the "a" direction, and give total growth in the "c" direction a relatively better chance. This should lead to formation of a spherulite according to the branching mechanism described by Bernauer, to which we referred in our original paper.

In Bernauer's original work with organic substances, he was able to grow spherulites from 96 melts using different materials and various addition agents. He attributed the growth of crystals, which visibly started as plates and developed into spherulites, to adsorption of the addition agent. More recently, Vonnegut "Influence of Butyl Alcohol on Shape of Snow Crystals Formed in the Laboratory," *Science*, vol. 107, p. 621, (1948), and private communication has made enlightening experiments. He has grown snowflakes as hexagonal plates or prisms, depending on whether butyl alcohol vapor was present or not. He used the same seeding agent in all cases, so nucleation does not seem the paramount consideration.

According to Vonnegut, adsorption of butyl alcohol is responsible for changing growth conditions so prisms result instead of the hexagonal plates expected. He furthermore includes the well-known demonstration that cubic shapes will precipitate from a pure salt solution, but by addition of the urea the external habit of the precipitate becomes octahedral. By analogy to the above, we believe magnesium, cerium, calcium, etc., impede growth of flakes and favor growth of crabs, cartwheels, and spherulites.

We are indebted to Messrs. Donoho and Rehder for their written discussions and

(Continued on Page 97)

CHAPTER ACTIVITIES

(Continued from Page 76)

Show, to be held May 1 through 7 in Atlantic City and to plan the Chapter's *"International Night,"* scheduled for March 18.

Mr. Maloney told of his recent trip to Europe, during which he met the heads of several European foundry organizations and visited foundries in several countries.

A.F.S. National Secretary-Treasurer Wm. W. Maloney outlines plans for the 1952 A.F.S. International Foundry Congress & Show during Central New York Chapter's "International Night" January 11.

Eastern Canada

A. E. Cartwright
Crane, Ltd.
Chapter Reporter

LARGE AUDIENCE at the December 14 meeting, held at the Mount Royal Hotel, Montreal, heard Albert F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, discuss *"Coordination Function of Pattern Equipment and Castings."*

Mr. Pfeiffer brought along a most interesting collection of exhibits that he used with slides to point up his recommendation that wooden models of complicated castings be made for study before designing pattern and core box equipment.

In cases where several foundries produce castings from the same pattern equipment, Mr. Pfeiffer strongly recommended Allis-Chalmers' practice of calling in representatives of foundries concerned so that ample consideration can be given to their existing facilities before pattern equipment is designed.

In discussing the use of skeleton patterns, Mr. Pfeiffer laid great stress on the desirability of building strength and rigidity into them for savings in

time and labor and in producing castings to accurate dimensions. The speaker also outlined a novel scheme for obtaining double quantity production from certain types of matchplate patterns by use of slab cores across the mold joint and use of reflected patterns in the cope and drag. In conclusion, Mr. Pfeiffer cited economies possible in production of core boxes and driers in the shell molding process.

Caught by the photographer at Central Michigan Chapter's November 28 meeting were, left, William Hambley, Charles A. Krause Milling Co., and Chapter Chairman T. T. Lloyd, Albion Malleable.

Northwestern Pennsylvania

Roy A. Loder
Erie Malleable Iron Co.
Chapter Reporter

BIGGEST AND BEST holiday stag party in chapter history was held December 14 at the Siebenburger Singing Society Headquarters in Erie.

Some 300 members and their guests enjoyed a social hour and dinner. Following this was an excellent floor show that included several well-known local radio and television stars.

Entertainment Committee, headed by Chairman R. C. Strong, Griswold Mfg. Co., consisted of Jacob Diemert, Erie Castings Co.; Bailey D. Herrington, Hickman, Williams & Co.; Edgar J. Sierk and Fred Carlson, Weil-McLain Co.; Robert Humphreys, Griswold Mfg. Co.; and Duane P. Davis, Urick Foundry Co.

Rochester

Herbert G. Stellwagen
Hetzler Foundries, Inc.
Publicity Chairman

TRIPLE THREAT MEETING featured talks by A.F.S. National Secretary-Treasurer Wm. W. Maloney, A.F.S. National Director Lloyd D. Wright,

Headliner at Oregon Chapter's November meeting was Ralph L. Lee, Grede Foundries, Inc., Milwaukee, whose timely topic was "Do You Know Your Costs?" Photograph courtesy Norman E. Hall, Electric Steel Foundry Company.

U. S. Radiator Corp., Geneva, N. Y., and Principal Speaker T. J. Stanton of Induction Heating Corp., Brooklyn.

Both Mr. Maloney and Mr. Wright told of the various activities and projects of the Society and outlined plans for the forthcoming International Foundry Congress & Show, May 1 through 7 in Atlantic City, when A.F.S. will be host to world foundrymen.

Mr. Stanton's talk consisted of an informative and instructive discussion of *"Dielectric Core Making."*

The application of high voltage and low current flow in specially-designed ovens permits thorough drying of sand cores, eliminates overbaking and burning and assures completely dry cores, Mr. Stanton said. By the use of resin binders, excellent results are obtained, and better castings with less cleaning are achieved through these cores, he said, adding that many causes of defects in castings from cores are eliminated by the dielectric baking process.

Since 1940 many practical installations have been made, Mr. Stanton said, and results have shown that cost of installation has been amortized in a short time. In making an installation of dielectric core ovens, he said, foundrymen can well consider many items of cost under present practice that can be cut down. Cores are baked completely and quickly. In instances where driers are used, fewer of these are required because of the rapidity of bake and quick return for re-use. Use of dielectric core ovens is practical in production shops and also in core making in job foundries making a variety of cores, Mr. Stanton concluded.

FUTURE MEETINGS & EXHIBITS

Feb. 18—AFS Quad City Chapter, Fort Armstrong Hotel, Rock Island, Ill., Bruce L. Simpson, National Engineering Co., *"Development of the Metal Castings Industry."*

Feb. 19—AFS Eastern New York Chapter, Circle Inn, Lathams, N. Y. L. D. Pridmore, International Molding Machine Co., *"Core and Mold Blowing."*

Feb. 20—AFS Central Michigan Chapter, Hart Hotel, Battle Creek, Michigan. Ralph L. Lee, Grede Foundries, Inc., Milwaukee, *"Foundry Cost Methods."*

Feb. 22—AFS Ontario Chapter, Royal York Hotel, Toronto, S. C. Massari, A.F.S. Technical Director, *"Gating and Risering."*

Feb. 21-22—AFS Southeastern Regional Foundry Conference, Tutwiler Hotel, Birmingham, Ala., sponsored by the AFS Birmingham District and Tennessee Chapters and University of Alabama Student Chapter.

Feb. 23—AFS Chicago Chapter, Palmer House, Chicago, Ladies Night.

Feb. 25—AFS Northwestern Pennsylvania Chapter, Moose Club, Erie, Pa., J. Allen Wickett, Monsanto Chemical Co., *"Some Aspects of the Shell Mold Casting Process."*

Feb. 25-26—Materials Handling Conference, Purdue University.

Feb. 29—AFS Chesapeake Chapter, Engineers' Club, Baltimore, Clyde L. Frear, Bureau of Ships, Washington, D. C., *"Advances in Non-Ferrous Foundry Technique."*

March 3—AFS Chicago Chapter, Chicago Bar Association. Round Tables.

March 3—AFS Metropolitan Chapter, Essex House, Newark, N. J., Clyde A. Sanders, American Colloid Co., *"Sands and Binders."*

March 3—AFS Central Indiana Chapter, Athenaeum Turners Hall, Indianapolis, Richard Herold, Borden Co., *"Ferrous Metallurgy and Foundry Practice."*

March 3—AFS Central Illinois Chapter, Legion Post Home, Peoria, T. E. Eagan, Cooper-Bessemer Corp., *"Practical Aspects of Nodular Iron."*

March 3-7—American Society for Testing Materials, Committee Week, Hotel Statler, Cleveland.

March 4—AFS—Rochester Chapter, Seneca Hotel, Rochester, N. Y., Guy A. Pealer, General Electric Co., *"Pattern Engineering."*

March 6—AFS Canton District Chapter, Elks' Club, Alliance, Ohio, Frank J. Steinebach, Penton Publishing Co., *"The Foundry in the Mobilization Program."*

March 10—AFS Central Ohio Chapter, Seneca Hotel, Columbus, Howard Ramsey, Archer-Daniels-Midland Co., Film: *"The A-D-M of Cores."*

March 10—AFS Philadelphia Chapter, Engineers Club, Philadelphia, W. C. Bryden, Moderator, Brass and Bronze Educational Course.

March 11—AFS Twin City Chapter, Covered Wagon, Minneapolis, Clyde A. Sanders, American Colloid Co., *"Effect of Mold Materials on Metal Shrinkage."*

March 12—AFS Toledo Chapter, Toledo Yacht Club, Toledo, Ohio, Louis Weber, Jr., *"Foundry Refractories."*

March 13—AFS St. Louis District Chapter, York Hotel, C. D. Mariarty, General Electric Co., *"Non-Destructive Testing."*

March 13—AFS Philadelphia Chapter, Franklin Institute, Philadelphia, Management Dinner. Guest Speaker: Rear Admiral H. N. Wallin, Chief, Bureau of Ships, U. S. Navy, Washington, D. C.

March 14—AFS Texas Chapter, Tyler, Texas. T. E. Eagan, Cooper-Bessemer Corp., *"Practical Aspects of Nodular Iron."*

March 14—AFS Southern California Chapter, Rodger Young Auditorium, Los Angeles, Hiram Brown, Solar Aircraft Co., *"Light Alloy Foundry Practice."*

March 14—AFS Eastern Canada Chapter, Montreal. Speaker: Howard F. Taylor, Massachusetts Institute of Technology.

March 13-14—AFS Michiana Chapter, Sand School, Oliver Corp., Plant 1, South Bend, Ind.

March 14—AFS Central New York Chapter, Hotel Onondaga, Syracuse, N. Y., Walter E. Sicha, Aluminum Co. of America, *"Non-Ferrous Production."*

March 17 — A.F.S Northern California Chapter, Hotel Shattuck, Berkeley, Cal., Hiram Brown, Solar Aircraft Co., *"Light Alloy Foundry Practice."*

March 17—AFS Quad City Chapter, Fort Armstrong Hotel, Rock Island, Ill., Ralph L. Lee, General Motors Corp., *"Science of Humanics."*

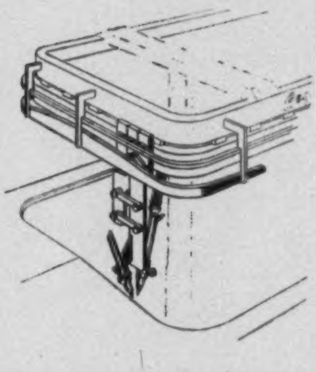
(Continued on Page 86)

NEW Foundry Products

For additional information on New Products, use postcard at bottom of this page.

Armor Casting Scarfer

1—Maker reports his new armor plate casting scarfer can hold tolerances of 1/64 in. Machine trims edges of double-curved surfaces, effectively preparing welding surfaces to accepted industrial standards. Accomplished by twr oxy-acetylene torches



positioned over the casting by articulated sections or "trains" which follow machined tracks. Torches follow prescribed path to cut castings to required apex in horizontal or vertical planes and around curves. *Cogmatic Co.*

Nickel-free Electrode

2—EutecTrode 27 is a nickel-free welding electrode especially useful in salvaging cast iron parts. Rod gives high-tensile weld with uniform carbon in deposit. *Eutectic Welding Alloys Corp.*

Test Sieve Shaker

3—Used for screen analysis work, Model TSS-15 test sieve shaker is small, portable, quiet in operation. Power: 110 volts, 60 cps. Electromagnetic drive produces vibrating action; amplitude is regulated by rheostat on front of base cabinet. Shaker handles six 8-in. sieves. *Syntron Co.*

Wet Blast Chemicals

4—Abrasives, rust inhibitor, and an anti-packing chemical for wet blasting machines are available from stock. Abrasives can be supplied from 80 to 2500 mesh, packaged in 50-lb weights. Rust inhibitor is liquid, does not stain. *American Wheelabrator & Equipment Corp.*

Stripping Oil

5—Oil stripping medium said to be so stable decomposition is negligible. Continuous 6-months' test showed all original properties required retained; only additions were to replace oil carried off as film. Medium is designed specifically for hot dip tin and terne plating industries. *Archer-Daniels-Midland Co.*

Continuous Mills

6—Available in sizes from 2 ft diam by 2 ft long to 10 ft diam by 24 ft long, continuous ball or tube mill is adaptable to fine or coarse, wet or dry, open or closed circuit grinding. May be used to deliver finished product or with classifying equipment. Hollow trunnions provide for continuous feed and discharge. Mills may be lined for grinding materials with minimum of metallic contamination; linings are easily replaced through large manhole. *Patterson Foundry & Machine Co.*

Creep Recorders

7—Two new recorders have been built for Baldwin lever-type creep machines and 4000-lb creep-relaxation testers. For creep recording, specimen deformation of 0.020 in. produces full-scale pen carriage movement of 10 in. across strip chart. Synchronous motor drives chart at 1/4 in. per hour,

(Continued on Page 94)

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FOUNDRY *Literature*

For additional information on Foundry Literature use postcard at bottom of this page.

Arc Furnace Accessories

12—Electrical equipment for arc furnaces is described in 20-page booklet B-4695. Equipment includes furnace controls, circuit breakers, transformers, regulators, control panels. Booklet discusses applications on direct and submerged arc furnaces in steel mills, foundries, nonferrous metal refineries. *Westinghouse Electric Corp.*

Electropolisher

13—Bulletin provides information on equipment, theory, and practice of electrolytic polishing of metallurgical samples. *Buehler Ltd.*

Contour Machining

14—Comprehensive 16-page catalog, illustrated in 2 colors, explains advantages and manufacturing short-cuts of contour machining with band tooled machines. Presentation is centered around a transparent machine model. Data covers machining techniques, sawing and filing rates, tool and accessory selection, and standard machines. *DoALL Co.*

Refractories Data

15—Data booklet of 8 pages lists standard series fire brick, cupola blocks, wedge, key, arch, and circle brick used for building, relining, repairing furnaces. Unit dimensions and quantities required to turn a circle are given, together with guides for estimating solid straight wall construction. *Ironton Fire Brick Co.*

Boiler Settings

16—Reference material on boiler operation and maintenance is contained in 24-page catalog and data book. Gives numerous cross-section drawings, charts, technical illustrations, and other data on plastic and castable refractories and their applications in modern boiler settings. Information on refractory manufacture, design, and installation is also presented. *Ramtite Co., Div. of S. Obermayer Co.*

Carbon Mold Plugs

17—Carbon mold plugs improve cast ingot quality, prolong equipment life, improve operating practice, are economical. Advantages and standard sizes are listed in Catalog Section S-5600. *National Carbon Co., A Div. of Union Carbide & Carbon Corp.*

Molding Cost Calculator

18—Free slide rule will give cost per lb of good castings, when proper variables are matched. Conversion tables and other determinations are also possible. *National Engineering Co.*

Abrasive Disc Data

19—Including grain and grade recommendations, 4-page Form ESA-54 describes use and application of nut-inserted and bolt-inserted abrasive discs and cylinders for horizontal or vertical spindle disc and surface grinding operations. *Simonds Abrasive Co.*

Tin Touch-up Pencil

20—Pocket-size 4-page folder describes touch-up pencil for tinning hard-to-reach places, rust-proofing metal, and regalvanizing spots. Pencil sacrifices itself to protect iron or steel. *All-State Welding Alloys Co.*

Arc Welding

21—Pocket-size booklet gives information on metals and electrodes, types of electrodes, four essentials of welding procedure, color marking for identification of electrodes, types of joints, typical positions, standard steel shapes, characteristics of the fillet weld, causes of common welding troubles, average electrode consumption, handy reference information, and complete instructions for using several types of electrodes. *Hobart Bros. Co.*

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FUTURE MEETINGS

(Continued from Page 81)

March 18—AFS Eastern New York Chapter, Circle Inn, Lathams, N. Y., C. A. Robeck, Gibson & Kirk Co., *"Non-Ferrous-Foundry Practice."*

March 18-19—Steel Founders' Society, Annual Meeting, Edgewater Beach, Chicago.

March 19—AFS Central Michigan Chapter, Hart Hotel, Battle Creek, C. T. Greenidge, Battelle Memorial Institute, *"Research in the Foundry."*

March 20—AFS Washington Chapter, Frye Hotel, Seattle, Hiram Brown, Solar Aircraft Co., *"Light Alloy Practice."*

March 28—AFS Ontario Chapter, Royal Connaught Hotel, Hamilton, Group Meetings.

March 31—AFS Metropolitan Chapter, Essex House, Newark, N. J., C. A. Burgess, Gray Iron Founders' Society, *"Design for Castings."*

March 31—April 2—American Institute of Mining & Metallurgical Engineers, Hotel William Penn, Pittsburgh, National Open Hearth Conference.

April 1—AFS Rochester Chapter, Seneca Hotel, Donald Lavelle, American Smelting & Refining Co., *"Aluminum."*

April 7—AFS Chicago Chapter, Chicago Bar Association, Werner B. Bishop, Archer-Daniels-Midland Co., *"The Control of Core Production."*

April 14—AFS Philadelphia Chapter, Engineers Club, Philadelphia, Pa., *Brass and Bronze Educational Course*, B. A. Miller, moderator.

May 1-7—AFS International Foundry Congress & Show, Atlantic City, N. J.

May 14-16—Society for Experimental Stress Analysis, Hotel Lincoln, Indianapolis.

May 22-24—American Society for Quality Control, Syracuse, N. Y., Convention.

June 16-17—Malleable Founders' Society, Annual Meeting, Homestead, Hot Springs, Va.

June 23-27—American Society for Testing Materials, Annual Meeting, New York.

Sept. 8-10—American Standards Association, National Standardization Conference, Museum of Science & Industry, Chicago.

Sept. 8-12—Instrument Society of America, Cleveland, National Instrument Conference and Exhibit.

Oct. 16-17—Gray Iron Founders' Society, Annual Meeting, Cleveland.

Oct. 16-17—Malleable Founders' Society, Market Development Conference, Case Institute of Technology, Cleveland.

Oct. 16-18—Foundry Equipment Manufacturers' Association, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18 — AFS Michigan Regional Foundry Conference, University of Michigan, Ann Arbor. Sponsored by AFS Central Michigan, Western Michigan, Detroit and Saginaw Valley Chapters and AFS Michigan State and U. of Michigan Student Chapters.

Oct. 20-24—American Society for Metals, National Metal Congress and Exposition, Philadelphia.

Nov. 19—American Standards Association, Annual Meeting, Waldorf-Astoria Hotel, New York.

ABSTRACTS

Abstracts below have been prepared by RESEARCH INFORMATION SERVICE of The John Crerar Library from current American and foreign literature. For literature searches and translations of technical, industrial, and scientific literature, and photostats and microfilm, write to: Research Information Service, The John Crerar Library, 86 East Randolph Street, Chicago 1, Illinois. Rates for the above services will be furnished upon request.

Die Casting Assembly

A159—Consider Alloy Properties. "A Survey of Methods of Assembling Die Castings," *Die Castings*, vol. 9: (no. 8) August 1951, pp. 35-36, 38, 41, 58-61.

Methods, fasteners, and equipment which are especially adapted for use on die cast components are described. The non-ferrous metals which can be die cast lend themselves to certain types of fastening devices, and particular properties of the alloy used may affect the choice of fastener. The characteristics of the die-casting process, such as accuracy of coring of holes or forming of bosses and studs, also suggest certain methods of assembly.

Casting Non-Ferrous Alloys

A160—Production and Control Methods. Harold J. Roast, "Non-ferrous Castings Made at the U. S. Naval Gun Factory," *Metal Progress*, vol. 60: (no. 1), July 1951, pp. 61-64.

Non-ferrous foundry operations employed at the U. S. Naval Gun Factory in Washington, D. C., are described. The topics covered include the type of work being done, variety of alloys used, types of equipment employed, and methods of temperature control and heat treatment for stress relief. Some remarks on production techniques are included.

Iron Mold Life

A161—Factors Affecting Service. E. Feil, "On the Fabrication of Iron Molds," *Geisserei* vol. 38, July 26, 1951, pp. 345-355. (In German)

A systematic study was made of factors influencing the formation of scales on the inner surface of iron molds, which shorten materially the latter's service life. The foremost among these factors are the chemical constitution and the metallographic structure of the material of the mold, themselves determined by the nature of the original, by the smelting procedures, and by the methods of preparation and the dimensions of the molds. Numerous diagrams and microphotographs illustrate the work.

Hot-Blast Cupolas

A162—Development and Properties. K. Roesch, "Development of Hot-Blast Cupolas and Results Obtained," *Giesserei*, vol. 38, August 23, 1951, pp. 393-397. (In German)

Various data on the properties of the hot-blast cupolas are assembled here, obtained through the author's own expe-

rience and from outside sources. The information concerns construction models, methods of operation, efficiencies, working temperatures, metallurgical problems, and considerations of economy for high-grade malleable iron and cast iron foundries. A new arrangement, presenting one common recuperator heater for two alternately-working cupolas, is especially recommended.

Hot-Blast Cupola Theory

A163—Blast may be Preheated. W. von Preen, "Preheating of Cupola Blast," *Gjuteriet*, vol. 41, August 1951, pp. 117-121. (In Swedish)

The theory of hot-blast cupolas is discussed. It is shown that the blast may be preheated in a separately fired air heater or with the aid of waste gases from the cupola. Experience has shown that 375-450 C is an appropriate blast temperature. Heat flow diagrams show how the hot blast changes thermal conditions in the cupola. The advantages and disadvantages of the hot blast cupola are discussed.

Foundry Graphite

A164—How to Use It. Charles Dennery and Francois Pensa, "Graphite and its Applications in the Foundry," *Fonderie*, vol. 67, July 1951, pp. 2547-2564. (In French)

A detailed discussion is presented of the use of graphite in the foundry. The topics covered include the following: the properties of graphite; the methods of formation of graphite, including the decomposition of hydrocarbons, the high temperature heating of carbon, the dissociation of carbides and the crystallization of graphite in the interior of carbon-saturated alloys; the physical and chemical properties of synthetic graphite; the utilization of the refractory properties of graphite; the use of graphite in castings cores; the carburation of steels and cast irons; and other miscellaneous applications of graphite.

Manganese-Bronze Propellers

A165—Both Main Groups Covered. G. T. Callis, "Marine Propellers," *Metal Industry*, vol. 79, August 31, 1951, pp. 167-170.

A brief discussion is presented of some major problems associated with large manganese-bronze marine propellers, with indications of the field in which improvement in structural material is being sought. The manganese-bronzes are placed in two main groups, differing notably only with respect to tin and aluminum contents. The mechanical properties of the alloys are reviewed, and numerous causes of corrosion and cavitation are briefly summarized.

Continuous Casting Process

A166—Pilot Plant is Success. D. I. Brown, "Continuous Steel Casting Pilot Plant Proves Successful," *The Iron Age*, vol. 168, September 20, 1951, pp. 113-118.

Continuous casting of steel on a commercial scale is nearing reality. The only major problem remaining is the supplying of sufficient metal to the casting machine to maintain a truly continuous process. Rounds up to 7-in. diameter and slabs up to 3 x 15 in. are now being continuously cast and used as semi-finished products to feed conventional rolling mills. Carbon and stainless steels have both been cast with equal success. A detailed discussion of the continuous casting process is presented, with a description and several illustrations of the apparatus.

Metal Processes Compared

A167—Weigh Various Factors. T. L. Roux, "Welded Fabrication Versus Casting," *The Engineer and Foundryman*, vol. 16: (no. 2), June 1951, pp. 37, 39, 41, 93.

The relative merits of casting and welded fabrication are considered. The various factors compared include cost considerations, possibility of failures, material usage and weight saving, appearance, and the question of delivery. The conclusion reached is that castings and fabrications should be regarded as separate entities with their own individual spheres of application.

Investment Molds

A168—Complex Pattern Dies. Rawson L. Wood and Davidlee Von Ludwig, "Designing Pattern Dies for Investment Casting—Part I," *The Tool Engineer*, vol. 27: (no. 2), August 1951, pp. 25-28.

Tool and die engineers are confronted with increasingly complex parts which must be introduced into dies for manufacture of the patterns required to pro-

duce investment molds. Metallurgical and mechanical design limits of dies for making wax, plastic or frozen mercury patterns are completely different from those which apply to forging, pressing or die-casting dies. A detailed discussion of the practical aspects of pattern die design for investment casting is included.

Aluminum Alloys

A169—Factors Affecting Properties. G. Burtler, "The Determination of the Mechanical Properties of Aluminum Casting Alloys," *Giesserei*, vol. 38: (no. 14), July 1951, pp. 320-324.

The mechanical properties of aluminum casting alloys are influenced by various factors, among them the casting cross section, casting temperatures, gas content, and rate of solidification. Among the mechanical properties considered are the strength and elongation, each of which is determined for a large number of alloys. The methods used in testing the specimens are described.

Non-destructive Testing

A170—For Improving Procedure. J. Oosting and B. Schuil, "Use of X-Ray Testing for Improvement of Foundry Procedures, Part I," *Metalen*, vol. 6, September 30, 1951, pp. 341-346. (In Dutch)

Illustrations of x-ray tests in the foundry are reported in connection with various observations and suggestions on foundry procedures themselves. In this first half of the paper, the advantages of feeding at atmospheric pressure are examined. The gate, of sufficiently ample dimensions to prevent early solidification, is placed so as to feed the thickest part of the casting. By these measures a long-lasting communication with the outer air is insured and vacuum holes avoided.

Dipping Pipe in Tar

A171—Improves Coating. F. R. Adams and G. E. Loftin, "Continuous Dip System Improves Tar Coating," *The Iron Age*, vol. 168, August 2, 1951, pp. 92-94.

A continuous dipping system using a heated tar bath for cast iron soil pipe and fittings gives a coating superior to that produced where pipes are heated and then dipped. Products cannot be overheated in the bath, and just enough residual heat for quick drying is retained.

Synthetic Sand

A172—Preparation and Use. M. Pierre Nicolas, "The Improvement of Synthetic Argillaceous Sand," *Fonderie*, no. 66, June 1951, pp. 2403-2412.

A discussion of the results of diverse studies having as an object the exact determination of the optimum conditions of preparation and use of synthetic argillaceous sand covers the following topics: (1) Influence of the form of the sand grains; (2) value of the principal clays of colloidal type from the point of view of the heat resistance of the synthetic sand; (3) reaction of the sand to heat; (4) modification of characteristics introduced by the addition of mineral black; (5) synthetic argillaceous sand as a moisture stabilizer.

PERSONALITIES

(Continued from Page 65)

O. J. Myers has been appointed to the newly created position of technical director at Archer-Daniels-Midland Co., Cleveland. He will be in charge of all technical activities of the company's Foundry Products Div. **J. David Johnson** assumes the position Mr. Myers held since 1945.

Walter W. Moore, works manager, Burnside Steel Foundry Co., Chicago, has been elected a vice-president of the company. Starting with the company in 1934, he became foundry superintendent in 1941 and works manager in 1948. He was vice-president of the Chicago Chapter of A.F.S. in 1950-51 and is currently president of the group.

Harold E. Erf, 12-year representative for Sterling Grinding Wheel Div., has been appointed sales executive-administration. Mr. Erf will be located at the home office in Tiffin, Ohio. Also promoted were **John Andreas** and **Edward Kass.** Both were appointed sales representative, with headquarters in Chicago.

Dr. J. C. Warner, president of Carnegie Institute of Technology, has been invited to India to deliver a series of six lectures at the Tata Iron and Steel Co., Ltd., Jamshedpur, India. Dr. Warner is the fourth speaker in "The Perin Memorial Lectures" series, inaugurated in 1938 but periodically interrupted by unsettled world conditions.

Ben Kaufman is the new assistant to **Sidney Danziger,** eastern vice-president of H. Kramer & Co., Chicago.

L. J. Carson has been named general manager of the new Colmar, Pa., plant of Link-Belt Co., Chicago. Plant will be in operation the last quarter of this year. Mr. Carson resigned his position with the OPS to accept.

Robert F. Mehl, director of Carnegie Institute of Technology's metals research laboratory and head of metallurgical engineering department, Pittsburgh, spent January in Brazil heading a commission of the Technical Cooperative Administration under the auspices of the State Department. Dr. Mehl studied the possibilities of developing the iron and steel industry as well as metallurgy in general.

OBITUARIES

Rufus F. Harrington, 61, retired manager of the iron and steel foundries of Hunt-Spiller Manufacturing Corp., Boston, died December 29 at his home in Wellesley, Mass. Long prominent in the field of sand research, Mr. Harrington presented his first paper on the subject before the 1917 A.F.S. Convention. Five years later, he was named to the original committee on Molding Sand Research organized jointly by A.F.S., the National Research Council and the American Society for Testing Materials. Associated with Hunt-Spiller from his graduation from

Tufts College in 1913, until his retirement in 1949, Mr. Harrington was accorded many honors for his work in advancing the foundry industry and its technology. Among these were Honorary Life Membership in A.F.S. and the A.F.S. John A. Penton Gold Medal, presented in 1943 "for outstanding pioneering work in foundry sand control." Mr. Harrington was also a past National Director of A.F.S. (1931-35), past president of the New England

R. F. Harrington

Foundrymen's Association, past president of the Boston chapter of the American Society for Metals, and for many years was chairman of the A.F.S. Sand Division's Committee on Conservation and Reclamation of Foundry Sands.

James R. Wyatt, vice-president, Ajax Electric Furnace Corp., Philadelphia, died December 2. Mr. Wyatt, who began his career as a helper in the chemical laboratory of Ajax Metal Co., headed a group responsible for building the first induction furnace during World War I, known as the Ajax-Wyatt Furnace.

J. Ernest Higson, 80, president of United States Foundries, Inc., and co-owner of Western Foundry, both of Denver, died in that city November 23. Member of a prominent Colorado foundry family, Mr. Higson acquired co-ownership of Western Foundry in 1907, a firm operated today by his sons, James L. and Roy Higson. Mr. Higson was for several years vice-president of United States Foundries, Inc., and in 1948 was elected president.

A. H. Popperwell, vice-president of Reliable Iron Foundry Co., Los Angeles, died recently. He was a member of the A.F.S. Southern California Chapter.

John E. Gill, foundry superintendent for Lake Shore Pattern Works, Erie, Pa., died December 13, 1951. He was 33 years old and a member of the Northwestern Pennsylvania Chapter of A.F.S.

James A. Rafferty, vice-president and director of Union Carbide and Carbon Corp., New York, died in Fort Lauderdale, Fla., December 19, 1951. He was 65 years old. Mr. Rafferty was a pioneer in the development of the synthetic organic chemical industry in the United States.

FOUNDRY FIRM *Facts*

Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, recently purchased **Champion Foundry & Machine Co.,** Rockford, Ill., and will manufacture and market the complete Champion line of core blowers, core rollover machines, molding machines and electric riddles. All sales and service will be handled by the Beardsley & Piper organization through its general offices in Chicago. Established by the five Magnuson brothers in 1913, B & P's newly acquired Champion Foundry & Machine Co. has been responsible for many innovations in foundry equipment that have become standard throughout the castings industry.

Trackson Co., Milwaukee, has become a wholly owned subsidiary of **Caterpillar Tractor Co.,** Peoria, Ill. 54,000 shares of Caterpillar common stock were exchanged for all of Trackson's capital stock. The Trackson board of directors will be reconstructed to include various Caterpillar officials.

Grinding Wheel Institute, Greendale, Mass., announces that its future mailing address will be 2130 Keith Building, Cleveland 15. This address will be shared with the **Abrasive Grain Association.**

Buckeye Products Co., Cincinnati, recently honored two employees for long service. President Arthur Hoffheimer presented wrist watches to Goble Russell, shop superintendent, and Carl Teschner, machinist, 25-year men.

Gerity-Michigan Corp., Adrian, Mich., announces its Logan Street plant has been producing armor plate as a sub-contractor to **Standard Steel Spring Co.** A wholly owned subsidiary, **Gerity Magnesium Corp.,** Adrian, recently started making magnesium sand castings.

Sonken-Galamba Corp., Kansas City, Kansas, reports that although cleanup required by the recent flood is still in progress, production has been fully restored.

Electro Metallurgical Co., A Division of Union Carbide & Carbon Co., New York, reports its Marietta, Ohio, plant will be ready in 1953. Costing $100,000,000, the plant is reported to be largest in the world. Four of the 24 eventual furnaces are now in operation. One product, extra-low-carbon ferrochromium, will be made here for the first time on a commercial basis late this spring. It is expected to simplify production of stainless steel and help relieve the present critical shortage of columbium.

Quigley Co. Inc., New York, has appointed four new sales representatives. Bud Reagan: Missouri, Kansas, Nebraska, Iowa, North and South Dakota, Minnesota, Wisconsin, and the Chicago area. Leroy Montgomery: West Virginia, western Pennsylvania, and the eastern and northern Ohio areas. Ira Stark: New York and the New England states. Jack Pitman: Texas, Louisiana, Alabama, southern Mississippi, and southern Arkansas.

Metallurgical Instrument Co., 2454 West 38th St., Chicago, is a new company formed to act as distributors for metallurgical and optical instruments manufactured by Officine Galileo, Milan, Italy. Heading the new organization are Alan Goldblatt of Chicago Spectro Service Laboratory, and Melvin A. Robin, consulting engineer.

Chain Belt Co., Milwaukee, has appointed **Cate Equipment Co.,** 49 East Ninth South, Salt Lake City, Utah, as its district sales office for chains and sprockets, flexible couplings, chain and belt conveyors, bucket elevators and sanitation and waste treatment equipment.

Solar Aircraft Co.'s San Diego, Calif., plant is saving critical alloys and, at the same time, money by operating its own stainless steel foundry—an operation unique among aircraft parts plants. The foundry, already the main source of Solar aircraft castings, may soon be able to meet growing demands for high alloy castings elsewhere in the aircraft industry. Started in 1946 as a research project, the Solar foundry now employs 30 men who turn out more than 700,000 lb of stainless castings per year. Quantities of scrap metal containing such rare constituents as nickel, tungsten, columbium and chromium, are remelted in the foundry for re-use. The Solar San Diego foundry has developed a method of casting titanium-stabilized stainless steel and is licensing other steel foundries under the process.

Hydro-Blast Corp., Chicago, has formed a wholly owned subsidiary, **Hydro-Blast Trading Corp.,** to handle all its activities in North and South America outside the United States. Organization of the new subsidiary does not constitute a change in management or company policy, but is designed to facilitate sales, delivery and servicing of Hydro-Blast products outside the United States.

Hyster Co., Portland, Ore., manufacturers of industrial materials handling equipment, recently held an open house on the occasion of the formal opening of its new General Assembly Building at 2902 E. Clackamas St., Portland.

NEW PRODUCTS

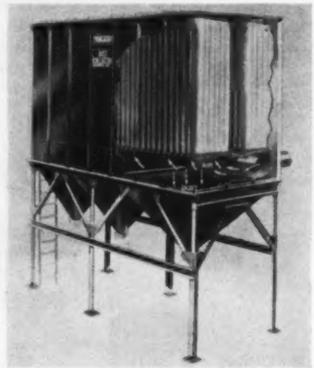
(Continued from Page 83)

FOR FURTHER INFORMATION ON NEW FOUNDRY PRODUCTS LISTED HERE USE CONVENIENT POSTCARD ON PAGE 83.

gives 7,200-hour record. For creep-relaxation records, conventional variable transformer type strip chart recorder shows lowering of stress in specimen maintained at constant tension at any temperature to 1,800 F. Both recorders have same external appearance. *Baldwin-Lima-Hamilton Corp.*

Dust Collector

8—For carbon black, cork, fine wood, graphite, lime, metal oxides, and other dusts with similar characteristics, cloth-bag



dust collector features simplified design of filter bags and mechanism for reclaiming dust. Collectors range from 5 to 40 ft long, contain from 1,360 to 10,880 sq ft of filter cloth, employ from 1 to 6 hoppers, and are built for various disposal—barrow, car, truck, etc. *Pangborn Corp.*

Casting Impregnating Equipment

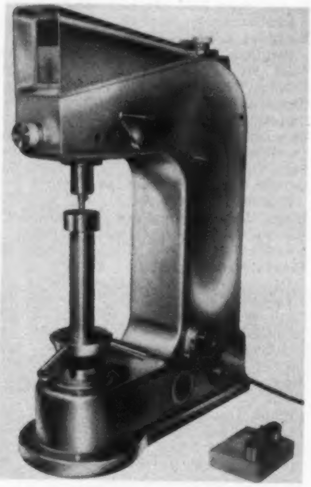
9—Model M-30 Mogullizer, designed for production line impregnation of castings, seals both leaking and weeping cast-

ings—ferrous and non-ferrous—under a high vacuum. Castings must have only minute porosity, fissures or pinholes. Placed in the sealing tank, they are subjected to a high vacuum. Next, an impregating solution is introduced into the

vacuum tank, followed by application of 100 psi air pressure, forcing solution into casting walls from all directions. Castings are then removed and rinsed in plain water. Manufacturer claims pressure castings sealed by this process have withstood hot oil and kerosene under pressures up to 10,000 psi. Cost of impregnation varies from 1/5 to 3 cents per lb., according to bulk. *Metallizing Company of America.*

Optical Hardness Tester

10—A product of Italy, the Officine Galileo Universal Hardness Tester is designed for Rockwell and Brinell hardness



tests, but can be adapted to special tests and Vickers measurements. Tester gives hardness measurements following the Rockwell method on any metal in the Rockwell A through F scales by direct reading. Tester uses lever arm supported on knife edges and projects a magnified image of the hardness reading on a screen. Features: automatic interchange of loads; oil damper for regulating load application speed. *Metallurgical Instrument Co.*

Non-ferrous Prototypes

11—Sample casting service will make prototype from all models and patterns in all non-ferrous metals. Products are ready for polishing, plating. Wall thickness no problem. *Pressure Cast Products Corp.*

Index to Advertisers

LETTERS

(Continued from Page 77)

now gladly expand upon our statement "that magnesium in some way stimulates nucleation and graphite begins to grow in the melt." The first part of the statement we retract in the sense it seems to us unimportant, but the second part, "graphite begins to grow in the melt," must remain. Only we cannot yet go as far as Mr. Donoho would have us, and add "always" to this phrase. We still consider the primary function of magnesium is to inhibit flake growth by adsorption, as above. In this sense, we do not believe ferrosilicon serves the same purpose. We are sorry we cannot help Mr. Donoho factually (as yet) regarding the "ubiquitous" nature of MnS from adsorption or interfacial tension viewpoints.

Mr. Rehder's query concerning breakdown of nodules into bunches of flakes by annealing at 1950 to 2150 F can possibly be explained by the viewpoint of Bernauer, who finds most spherulites contain so many defects they should be regarded more in the sense of crystal aggregates than single crystals. This suggests heat-treatment at 2000 F could sub-divide the spherulites into a substructure more akin to a "bunch" of flakes, rather than a single flake. We recommend Bernauer's book for Mr. Rehder, but we doubt if he will find much help there (or anywhere) concerning precipitation of separate flakes in solid white cast iron.

Finally, we note in private correspondence, that Prof. I. Iitaka, of Japan, concludes independently that surface energy and adsorption phenomena help account for the varied types of graphite found in different cast irons.

F. H. Buttner, H. F. Taylor
and John Wulff
Massachusetts Institute of Technology

We Did It And We're Sorry

You have already had letters similar to this, I imagine, and I would like to add my word of protest at the cover of the November 1951 issue of American Foundryman. The picture of two men pouring without any eye protection is a poor advertisement at a time when our industry is making such a concerted drive to present the foundries as a clean and *safe* place in which to work.

Even so small an item as this could be picked up by potential foundrymen or by those who seem always ready to run down the castings industry to the benefit of competing metal industries.

Working, as I do, for a company which lays great stress on safety and whose record speaks for itself, the sight of men pouring without eye coverage is a considerable shock. Subsequent application of air pressure to the pouring basin would seem to present an even greater hazard beyond the normal hazard of splash or spills. In fact, we would go so far as to discourage a ladle man from smoking while pouring as we have had instances where smoke in a man's eye interfered with his vision.

H. L. Springer, Jr.
Foundry Supervisor
E. I. du Pont de Nemours & Co.

A. F. S. Employment Service

To contact "Help Wanted" or "Position Wanted" advertisers, write to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5.

In replying to "Help Wanted" advertisements applicants for jobs must send an outline of background.

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HW569—Foundry Superintendent: for shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability and good practical and technical background. Excellent opportunity with long-established company of best reputation. Reply in confidence giving full information as to age, background and experience as well as salary requirements.

HW583—General Foundry Foreman: A large aluminum foundry in Michigan has opening for general foundry foreman. Applicant must be experienced in all phases of aluminum sand foundry work, including gating of patterns.

HW584—Steel Foundrymen: Opportunities for the following men in a large steel foundry—experienced unit foremen for Melted Metals Dept., Foundry, Core Room, C. F. & A., Inspection, Pattern—also openings for engineers and draftsmen. Gov't.-owned defense plant, Chicago area, to be operated on armor steel castings. Company operating set-up sufficiently large and aggressive to afford permanent opportunity to men whose performance proves to be outstanding.

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HW586—Young Metallurgist or Engineer: Preferably with foundry experience, for sales position with large chemical company. Sales and development work on use of synthetic resins in the foundry will be prime responsibilities. Previous sales experience to foundry industry desirable. Send complete resume.

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PW170—Plant Manager or Foundry Superintendent: Extensive experience in all departments, including labor relations and contract negotiations, methods, standards, material control, estimating and cost analysis. Work history and references upon request.

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6. Must be willing to give good references, both as to character and credit relations, and take job aptitude test. We pay all expenses for interviews and tests. Give all details and enclose picture or snapshot with letter of application. All replies will be held and treated in strict confidence.

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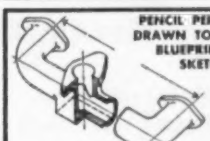

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